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Buried Aerial Aids Radio—Page 1

N.S.E. 25 CENTS

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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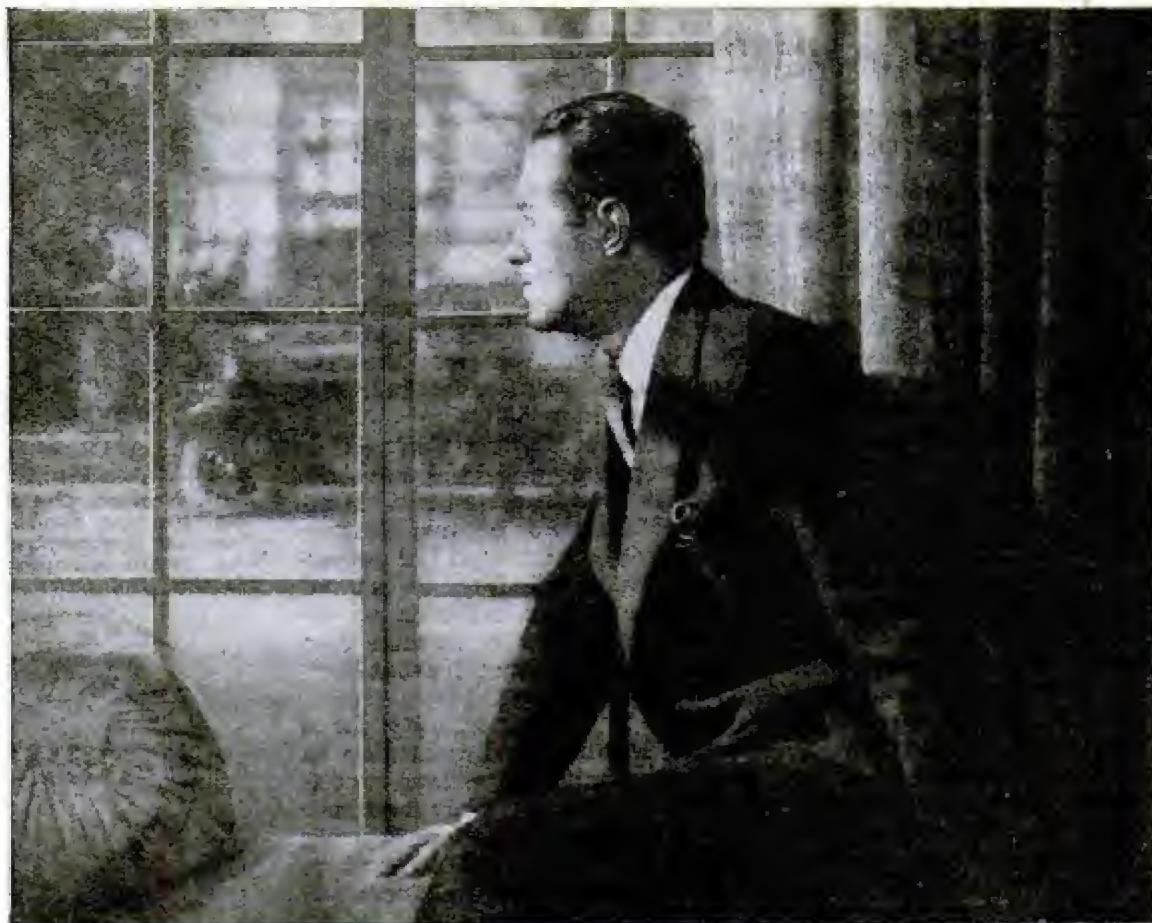
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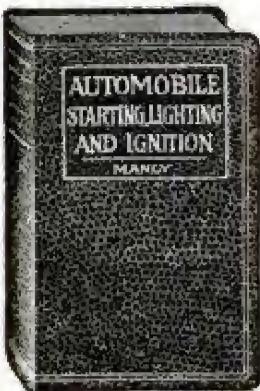
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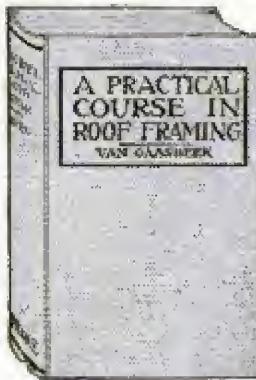
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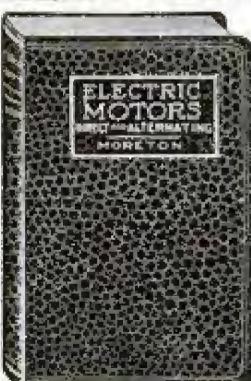
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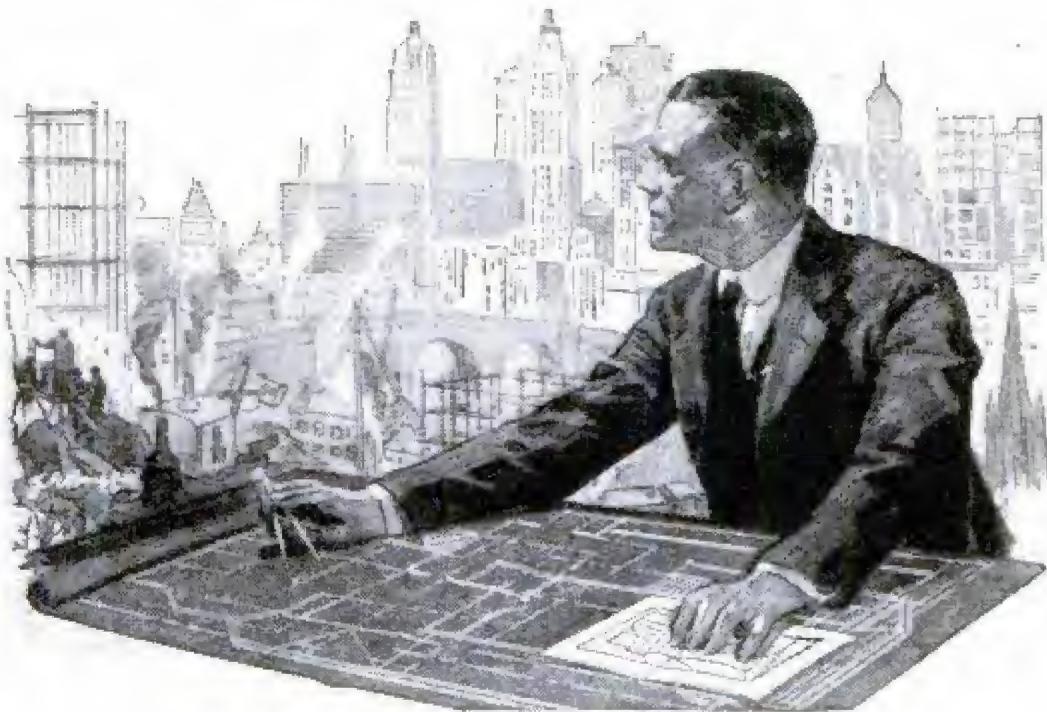
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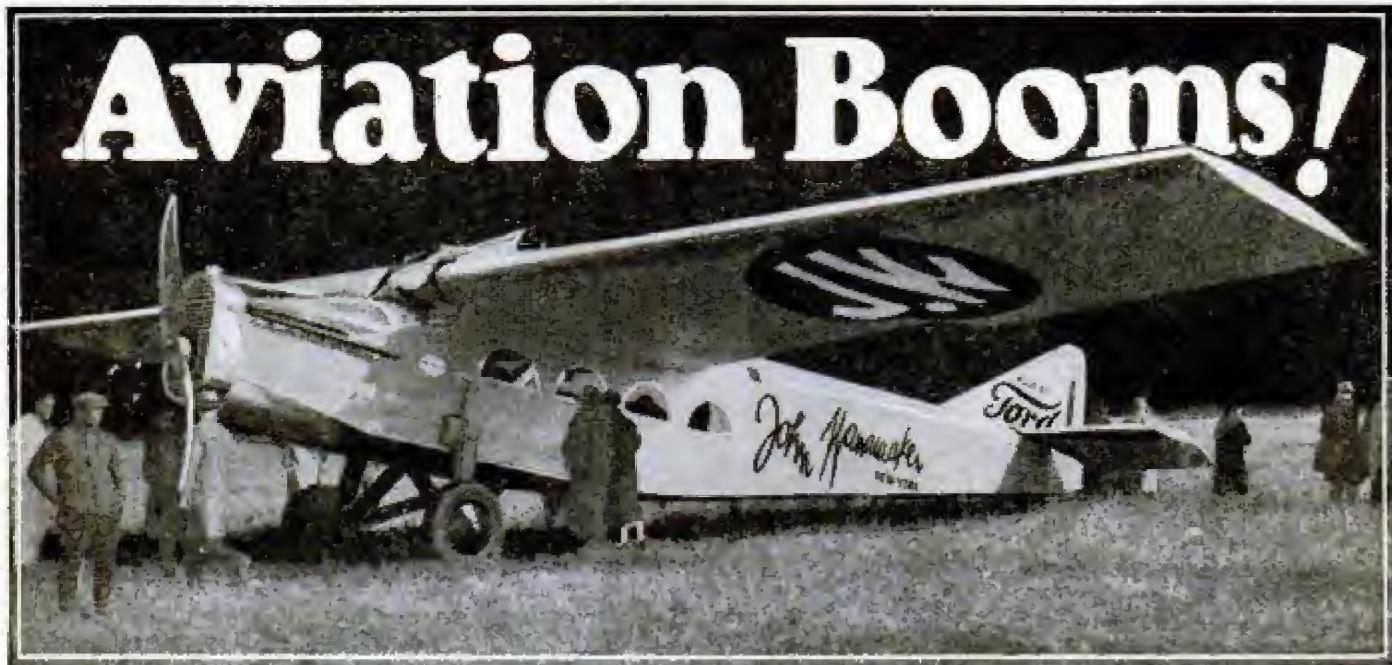
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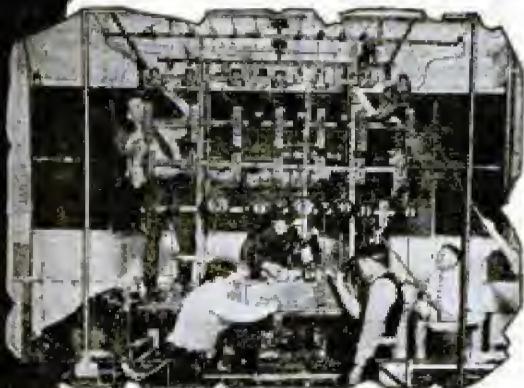
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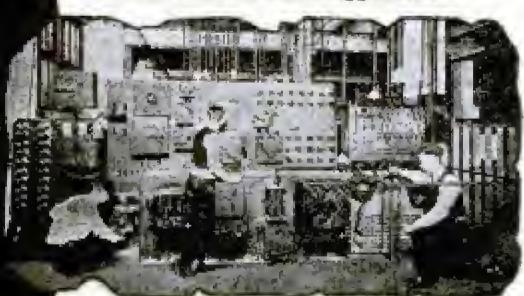
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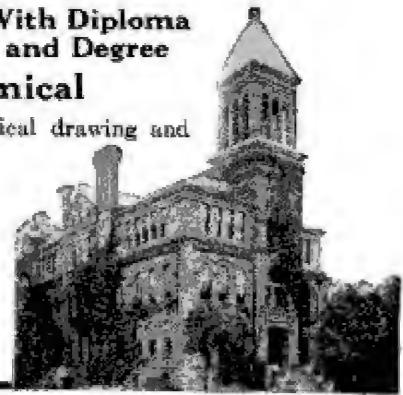
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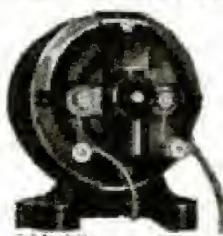
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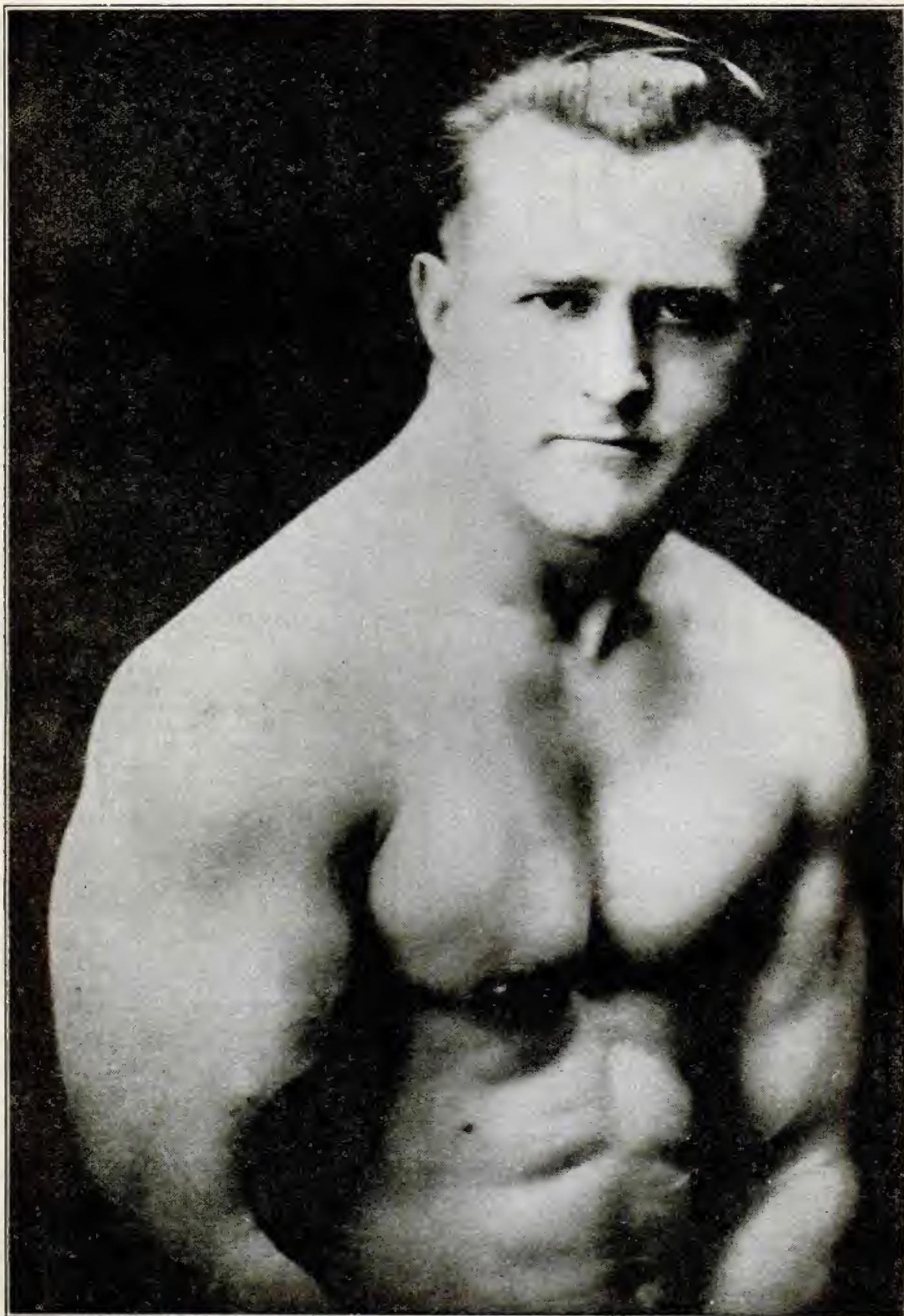
Chief Engineer Dunlap, Electrical Division
AMERICAN SCHOOL
Drexel Avenue & 58th Street, Sept. EB-74, CHICAGO

Send me your combination TRAINING-AND-JOB offer, 3 Free Electrical lessons, facts about opportunities in Electricity, etc.

Name

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City..... State.....



EARLE E. LIEDERMAN, *The Muscle Builder*
Author of "Science of Wrestling," "Muscle Building," "Secrets of Strength," "Here's Health," etc.

If You Were Dying To-night

and I offered something that would give you ten years more to live, would you take it? You'd grab it. Well, fellows, I've got it, but don't wait till you're dying or it won't do you a bit of good. It will then be too late. Right now is the time. Tomorrow or any day, some disease will get you and if you have not equipped yourself to fight it off, you're gone. I don't claim to cure disease. I am not a medical doctor, but I'll put you in such condition that the doctor will starve to death waiting for you to take sick. Can you imagine a mosquito trying to bite a brick wall? A fine chance.

A RE-BUILT MAN

I like to get the weak ones. I delight in getting hold of a man who has been turned down as hopeless by others. It's easy enough to finish a task that's more than half done. But give me the weak, sickly chap and watch him grow stronger. That's what I like. It's fun to me because I know I can do it and I like to give the other fellow the laugh. I don't just give you a veneer of muscle that looks good to others. I work on you both inside and out. I not only put big, massive arms and legs on you, but I build up those inner muscles that surround your vital organs. The kind that give you real pep and energy, the kind that fire you with ambition and the courage to tackle anything set before you.

All I Ask Is Ninety Days

Who says it takes years to get in shape? Show me the man who makes any such claims and I'll make him eat his words. I'll put one full inch on your arm in just 30 days. Yes, and two full inches on your chest in the same length of time. Meanwhile, I'm putting life and pep into your old back-bone. And from then on, just watch 'em grow. At the end of thirty days you won't know yourself. Your whole body will take on an entirely different appearance. But you've only started. Now comes the real works. I've only built my foundation. I want just 60 days more (90 in all) and you'll make those friends of yours who think they're strong look like something the cat dragged in.

A Real Man

When I'm through with you you're a real man. The kind that can prove it. You will be able to do things you had thought impossible. And the beauty of it is you keep on going. Your deep, full chest breathes in rich, pure air, stimulating your blood and making you just bubble over with vim and vitality. Your huge square shoulders and your massive muscular arms have that craving for the exercise of a regular he-man. You have the flash to your eye and the pep to your step that will make you admired and sought after in both the business and social world.

This is no idle prattle, fellows. If you doubt me, make me prove it. Go ahead, I like it. I have already done this for thousands of others and my records are unchallenged. What I have done for them, I will do for you. Come then, for time flies and every day counts. Let this very day be the beginning of new life to you.

*Send For My New
64 Page Book*

"Muscular Development"

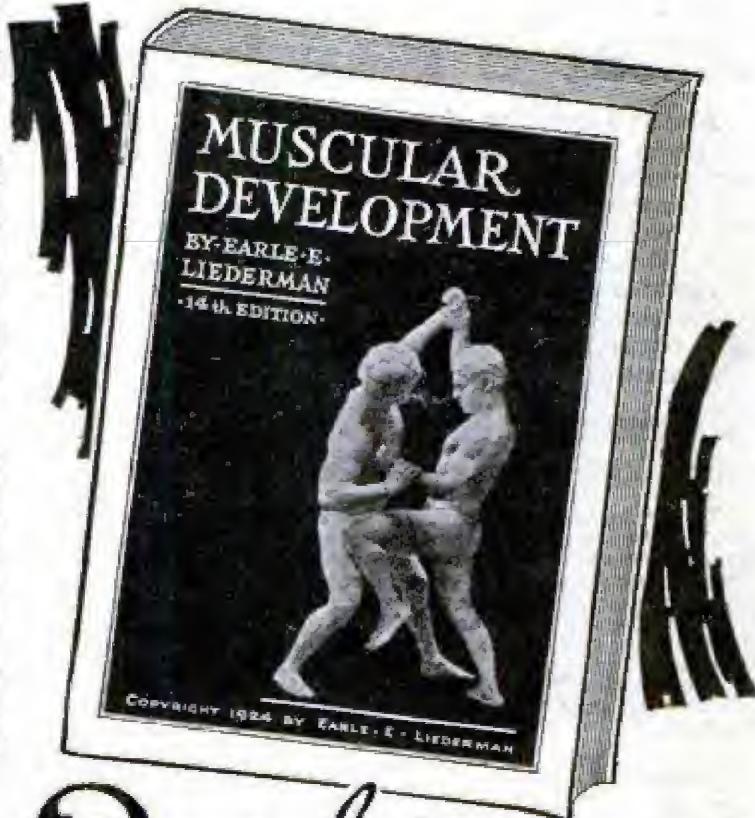
IT IS FREE

It contains over four dozen full-page photographs of myself and some of the many prize-winning pupils I have trained. Some of these came to me as pitiful weaklings, imploring me to help them. Look them over now and you will marvel at their present physiques. This book will prove an impetus and a real inspiration to you. It will thrill you through and through. And it's all yours, I don't ask a cent. This will not obligate you at all, but for the sake of your future health and happiness do not put it off. Send today—right now before you turn this page.

EARLE E. LIEDERMAN

Dept. 2007

305 Broadway, New York City



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Six months pass quickly—and \$6,000 a year is a lot of money. Many laboratory owners earn more. McCarrie trained experts rise rapidly to the class of big pay men. It's easy to establish your own laboratory after you have received our thorough training. No educational requirements are necessary to enroll. No mechanical experience needed. No text books—no home study—no classes—no lectures! Easy to learn. Never before has the man of moderate circumstances been offered such an opportunity.

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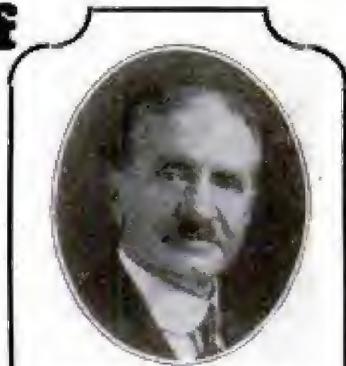
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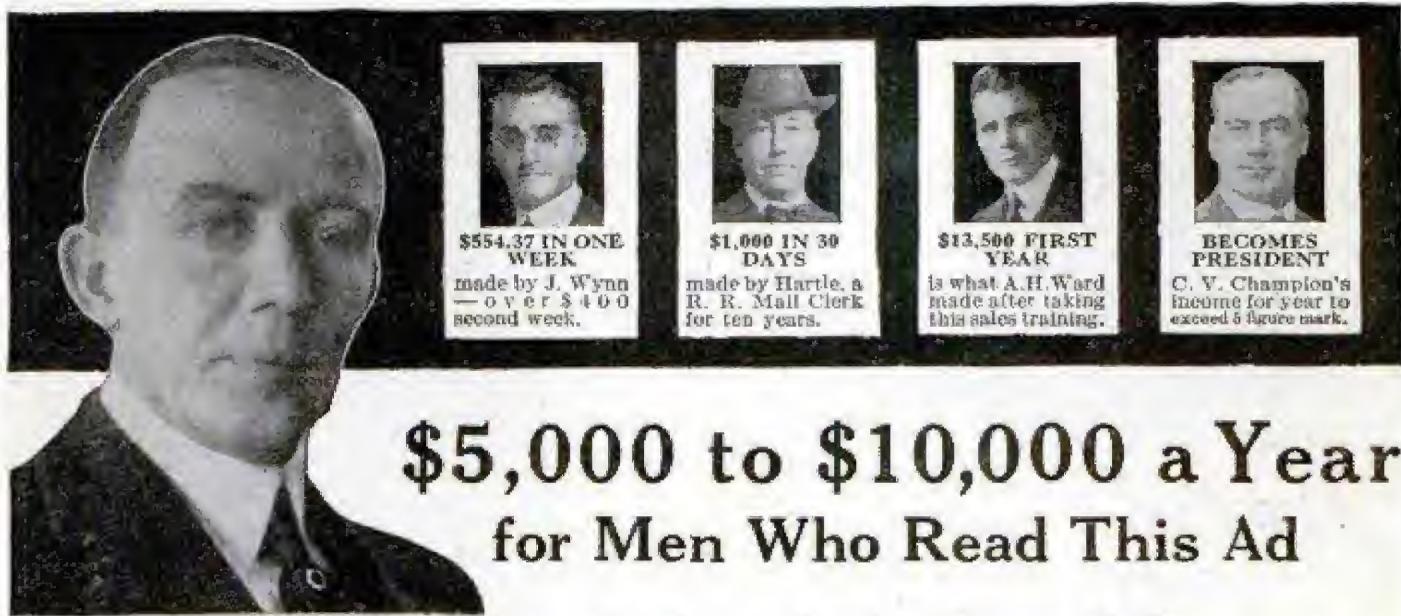
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The book you see below has been the starting point for thousands of men who are now successful salesmen. This book, "Modern Salesmanship," is now FREE.

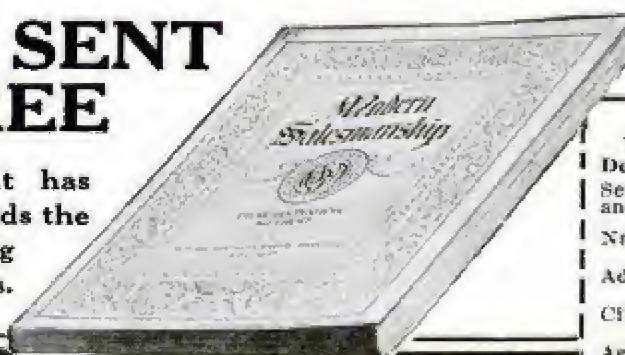
Rush the Coupon

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Dept. H-12

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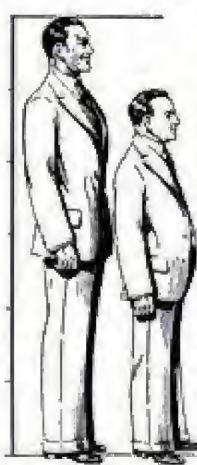
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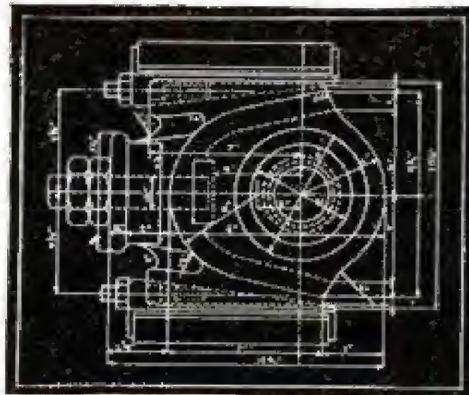
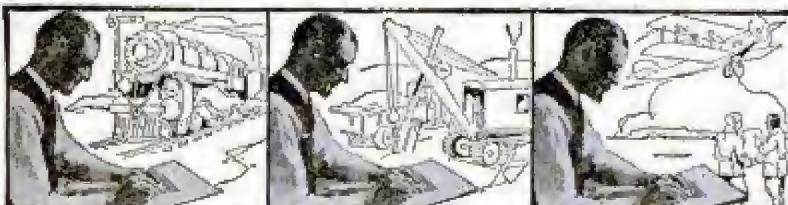
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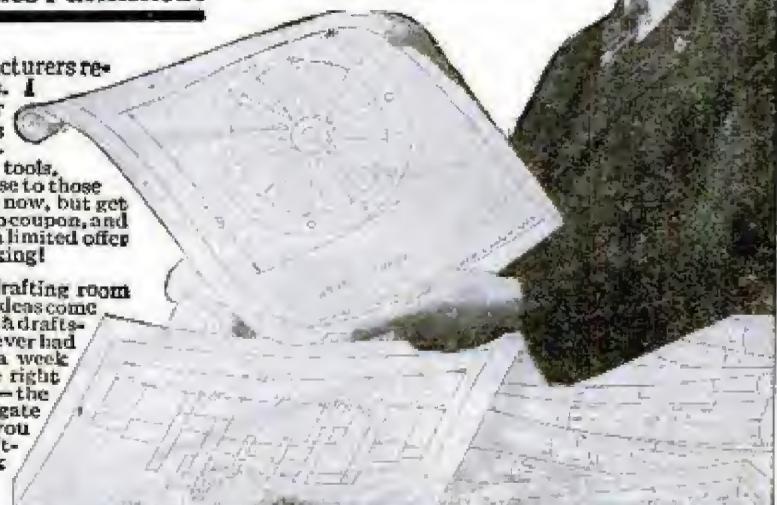
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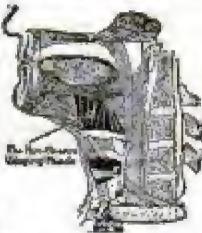
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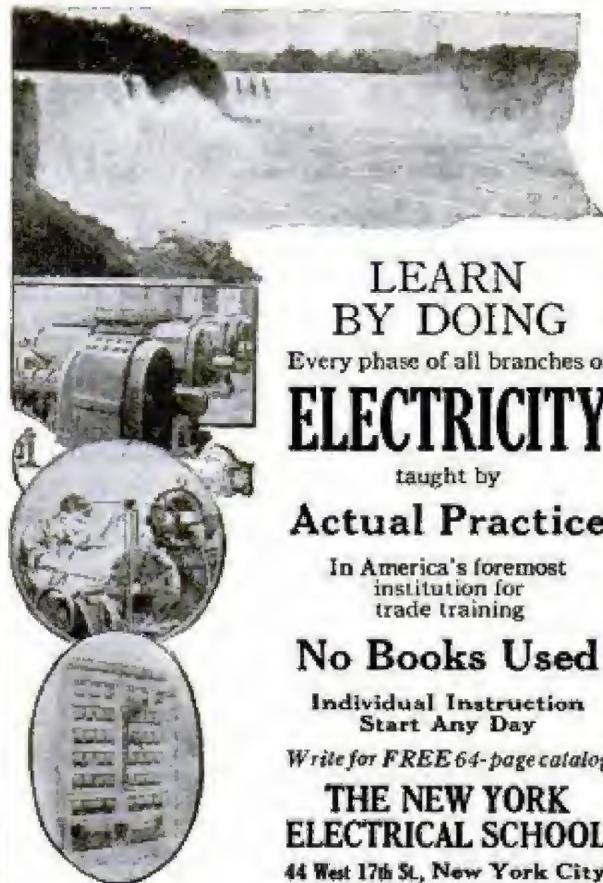
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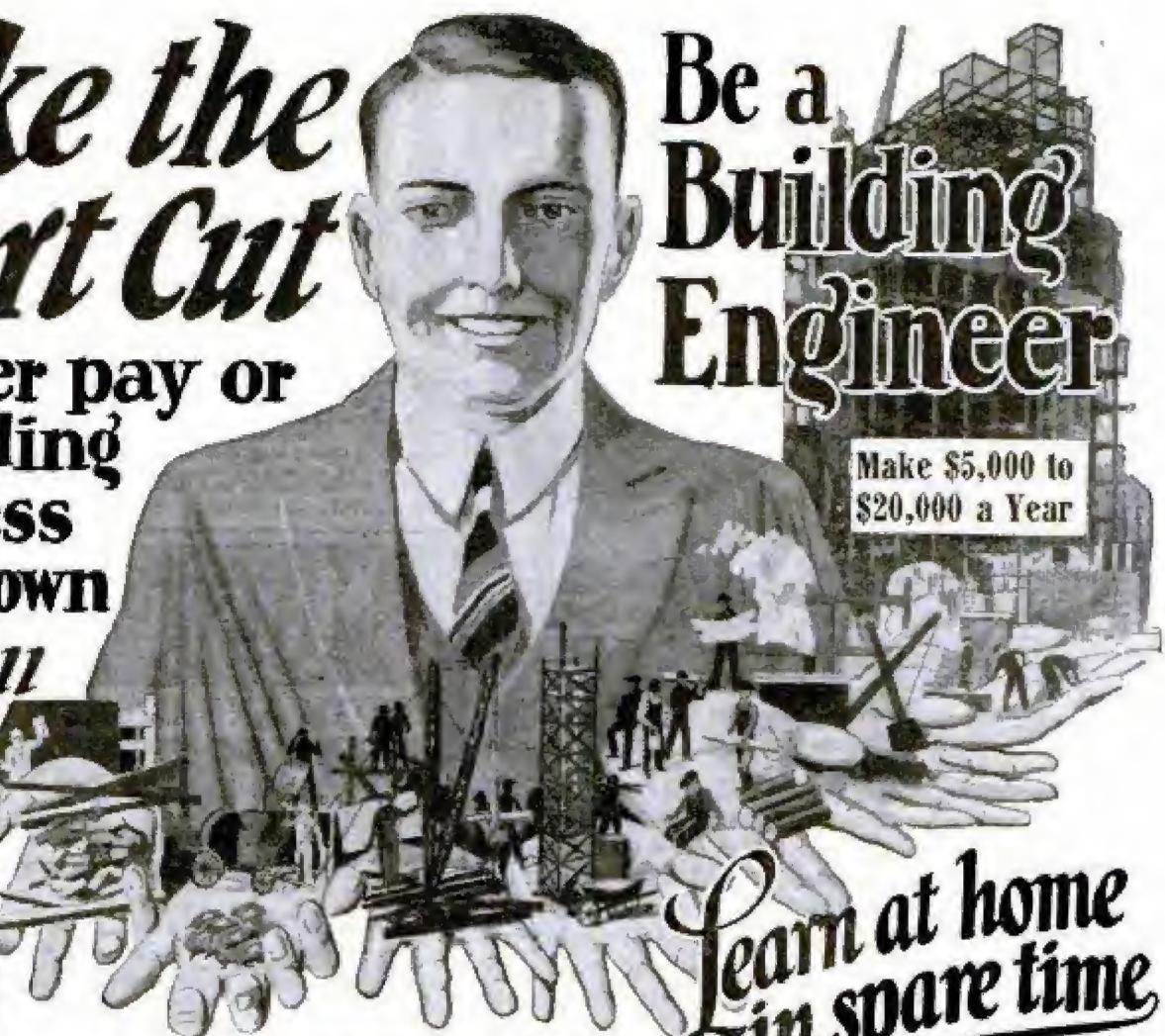
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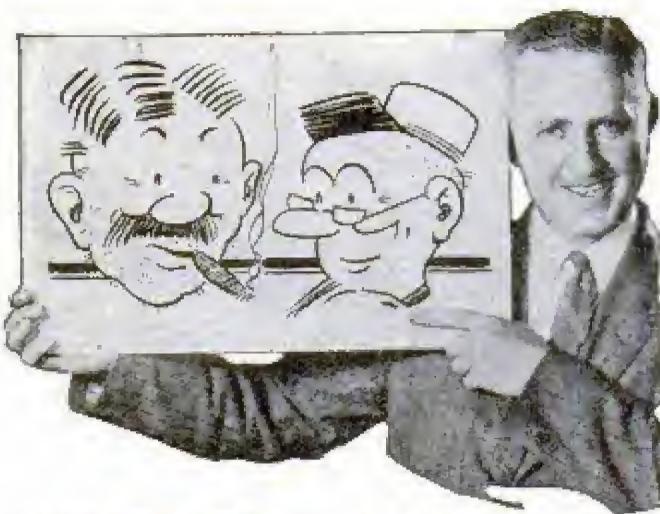
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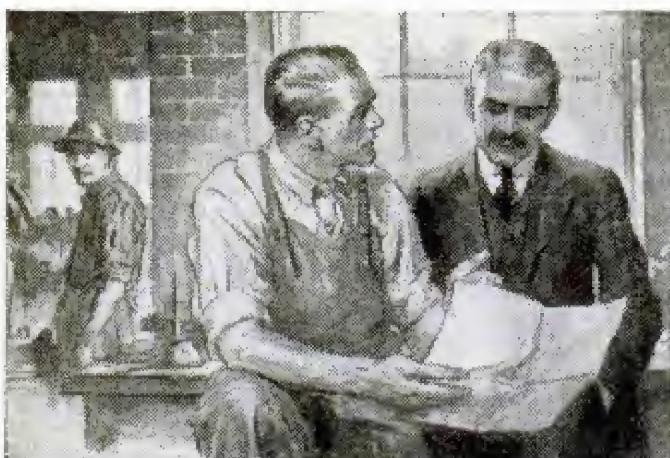
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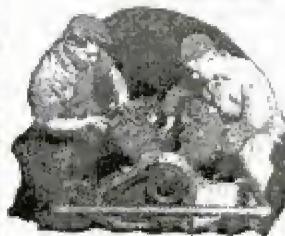
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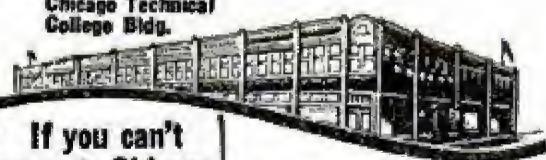
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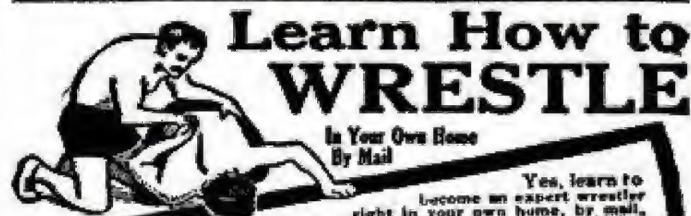
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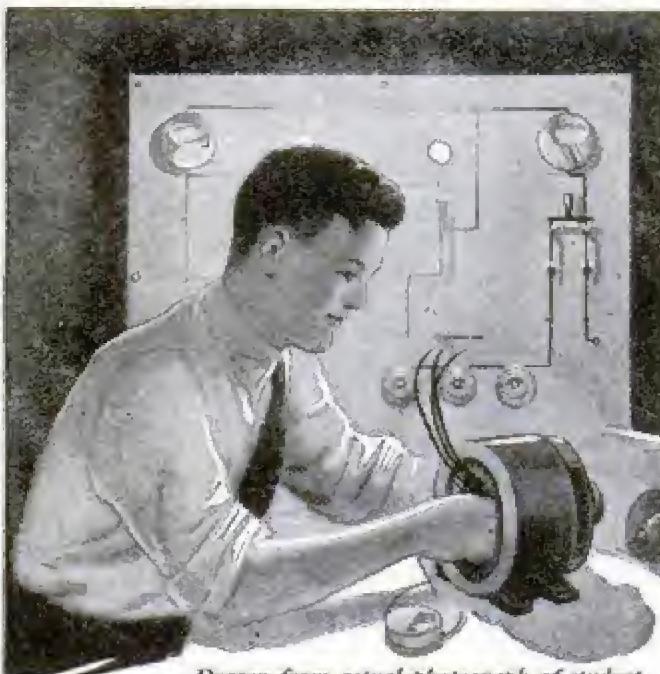
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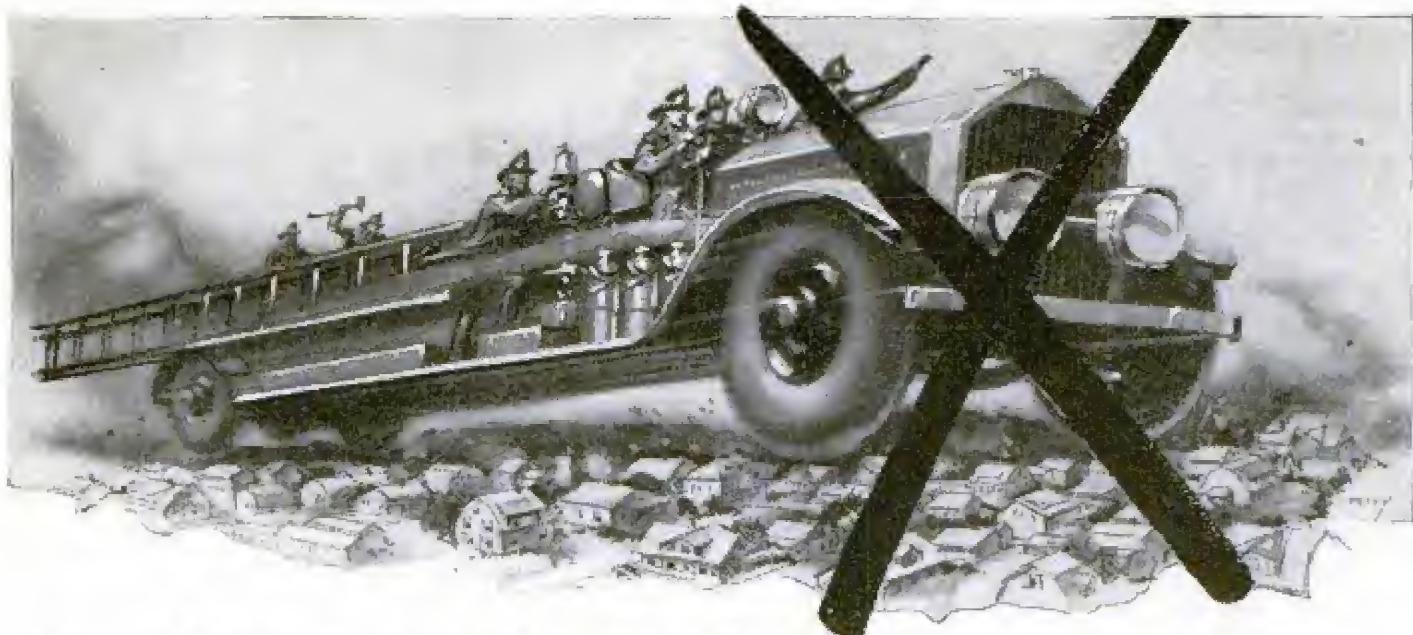
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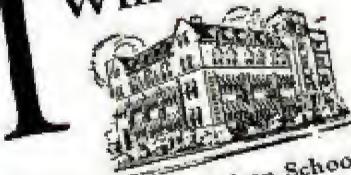
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Yours very truly,
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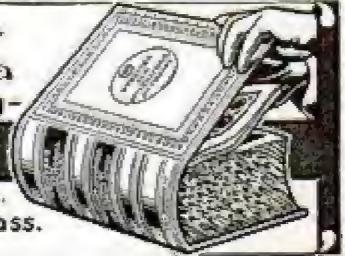
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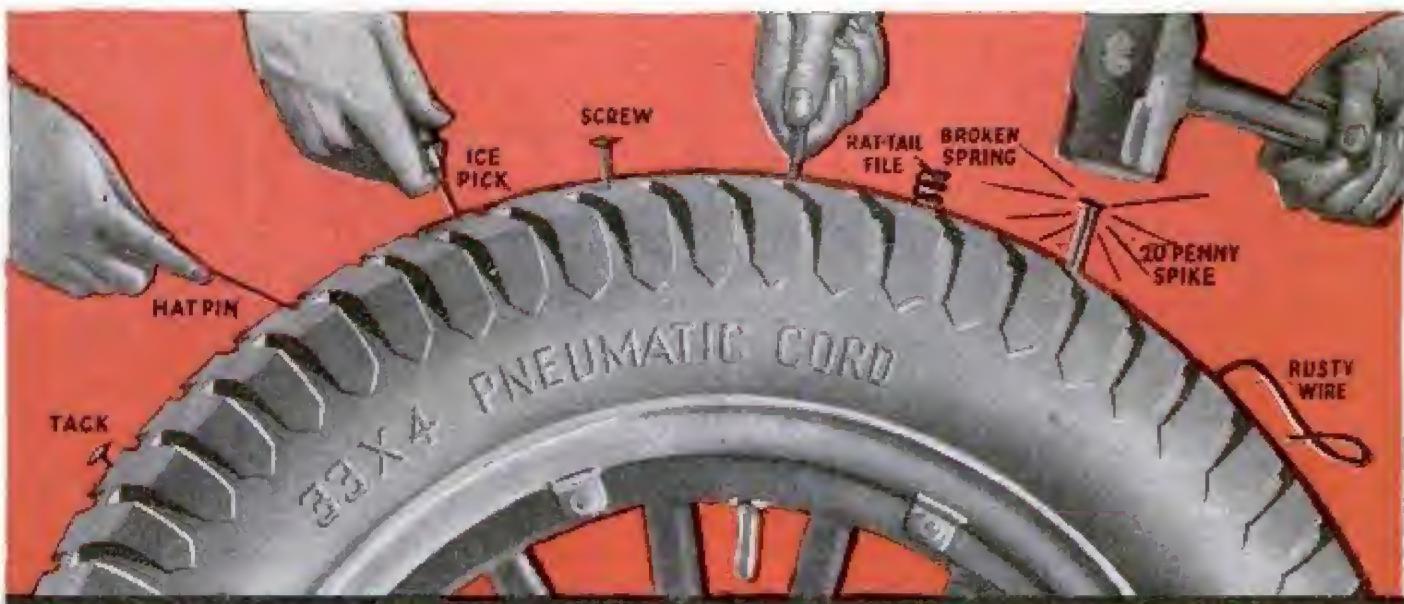
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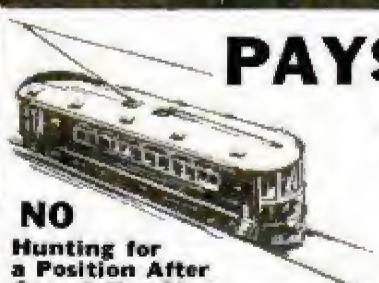
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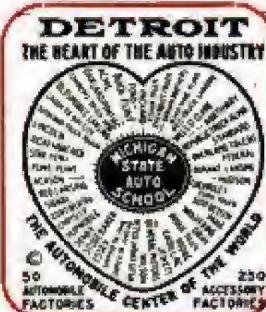
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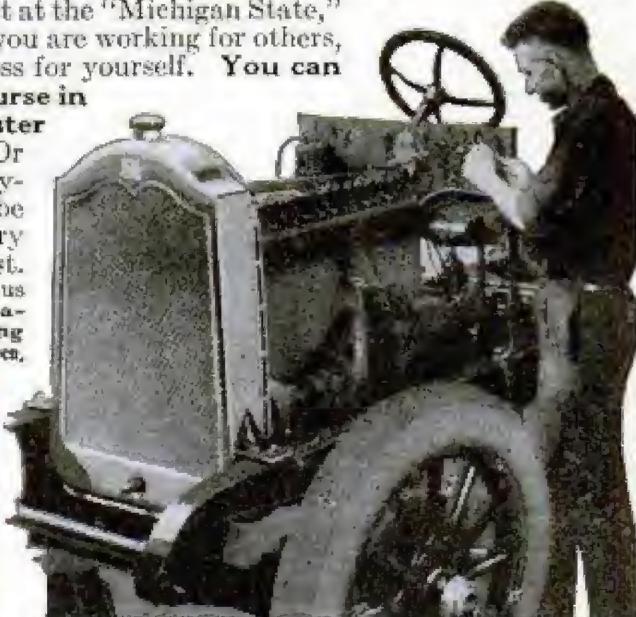
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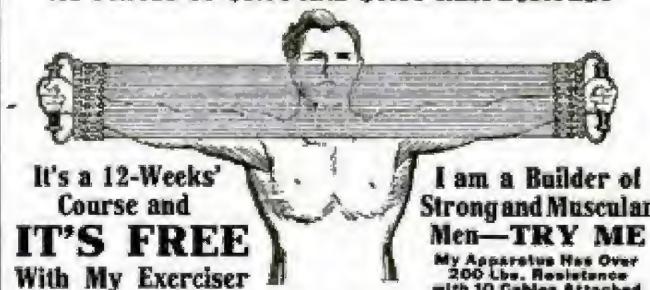
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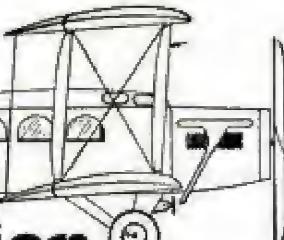
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Roll your own and save money. Makes them better and quicker besides saving more than half. Use your favorite brand of tobacco. Most useful and handy. Pocket size, weight $\frac{1}{4}$ oz. Made entirely of metal, nickel-plated. Price 25c postpaid.

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GREAT CURIOSITY! Smallest Bible in the World. Size of a postage stamp. 200 Pages. Said to bring good luck to the owner. A genuine work of art. Must be seen to be appreciated. Brings good money selling them to friends, church acquaintances, etc. PRICE 15c each. 3 for 40c, 12 for \$1.35, 100 for \$7.50. Also obtainable in Leather Binding, with gilt edges. Price 50c each, 3 for \$1.25, \$4.50 per doz. Magnifying Glass for use with Midget Bible, 15c.

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With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. Prices, postpaid: 40 Bills 25c, 120 for 50c, or \$3.50 thousand postpaid.

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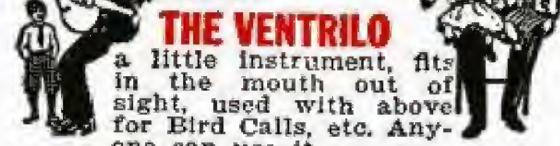
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BOYS!

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Sheaf Blank Cartridge
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POST-PAID
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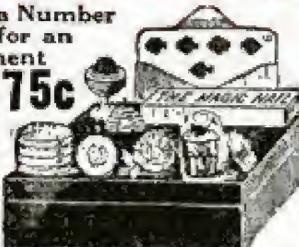
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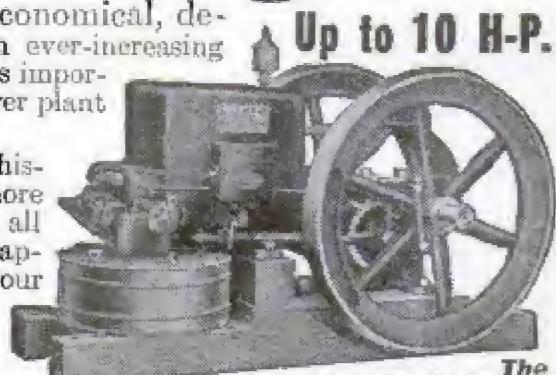
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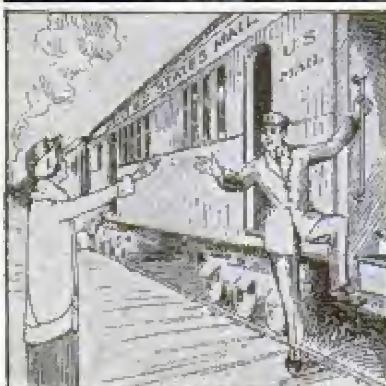
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SAVE \$8888, make your own beverages, extracts, polishes, flavors, etc.; from our reliable formulas and secret processes, absolute satisfaction guaranteed, valuable samples and interesting descriptive literature. 25c silver. Davis Company, Box No. 202, Rutland, Mass.

500 FORMULAS including Luminous Paint—Renewing Dry Batteries—Rehairing Micros—Gas Tonic—Puncture Pluggers, 25c. Catalog Free. Ideal Book Shop, Park Ridge, Ill.

SUCCEED With Your Own Products—Make them yourself. Formulas, Processes, Trade-Secrets. Modern master methods. Catalog free. R. Thaxt Co., Washington, D. C.

SWEEPING Compound. Make It. Sells everywhere. Good legitimate manufacturing business. 200% profit. Formula, \$5.00. S. O. Goodale, 231 Palm Court, Ft. Lauderdale, Fla.

500 VALUABLE Formulas, 25c. Circular Free. Harvey Teeple, Decatur, Ind.

10,000 FORMULAS. A real Gold Mine of money-making ideas. Tells how to make almost everything under the sun. You can make and sell cosmetics, mucilage, anti-freeze solutions, battery solutions, beverages, chewing gum, cleaning preparations, extracts, hair preparations, inks, bluing, leather polish, mirrors, perfumes, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. Send No Money. Just write a postal for "Henry's 20th Century Book of Formulas." Pay postman postage and \$1. Popular Mechanics Press, 200 E. Ontario St., Room 807, Chicago, Ill.

\$5.00 WILL furnish you with guaranteed formula for manufacture of any article. Chemical analysis of any nature. Chemical Technical Laboratories, 173 State St., Boston, Mass.

SPECIAL Formulas for Manufacturing and Business purposes. Any one you want \$5. You must be satisfied or your money will be refunded promptly. National Information Bureau, 318E Shepard Building, Grand Rapids, Mich.

FORMULAS. Guaranteed Best Chemical Science can devise. Stamp bring big bunch valuable literature describing Latest Reliable Processes for Manufacturing All Lines. Don't Buy till you've received these Profitable Propositions. No recipe-book or "Master Formula" trash. 25 years giving satisfaction. Miller Chemist, 1700-U Jetton, Tampa, Fla.

15,000 FORMULAS in "Scientific American Encyclopedia of Formulas." Includes following and many others: accidents and emergencies, agriculture, alloys and amalgams, artists' materials, beverages, cements, glues, pastes, mucilages, bleaches, renovating, coloring metals, dyeing, glass, heat treatment of metals, household formulas, ice cream, confectionery, chewing gum, lapidary work, exterminating vermin, lubricants, paints, varnishes, photography, condiments, canning formulas, rubber, soap, candles, soldering, toilet preparations, perfumes, waterproofing, fireproofing, writing materials. Send No Money. Just write a postal. When postman hands you book, pay \$5.50 and postal charges. Popular Mechanics Press, Room 807, 200 East Ontario St., Chicago, Ill.

AGENTS WANTED

NO Dull Times in the Food Business. Selling Federal Pure Food Products is the greatest, surest and safest business in the world today, and here is your opportunity to get into it. You can make \$5,000, \$5,000, \$10,000, or more per year—the only limit is your ability to take care of the business.

You will need no experience or money to get into this business. Your \$20.00 starting order sent on trust. We teach you everything you need to know. We furnish you with license. No Dull Times for the People Must Eat, and our food products are the fastest selling, surest and quickest repeat order goods in the world. Sell on sight in every home where food is used—repeat orders immediately and every week thereafter. A real big business all your own. Every new customer adds a great deal to your weekly income. Your business once established, has a market value just like a store and can be easily sold.

The greatest money-making opportunity of your lifetime because you risk absolutely nothing, as we guarantee your sales, and we will not let you fail. Remember! Guaranteed! Best products, biggest sellers, surest repeat orders. No capital or experience is required. We furnish capital and everything necessary for you to become a Federal Distributor. Exclusive territory will be given honest men or women who write at once. Federal Pure Food Company, 2309 Archer Avenue, Dept. A, Chicago, Ill. Largest packers of Pure Food specialties in the world. Reference, any bank, Dun or Bradstreet rating agency. Express or Railway Company in America.

\$75 a week, taking orders for suits at \$23.85. Others sell for \$40 and \$50. Big profits. We deliver and collect. Full or spare time. Send for unusual earning plan. Crane-Kent Clothes, Dept. H-35, 31 E. 12th St., Cincinnati, Ohio.

AGENTS—Every auto owner wants Noko-Rode Kaps, they stop all corrosion on battery terminals. Nine out of ten buy on sight. 100% profit. Noko-Rode Kaps Co., 10 E. Huron St., Chicago.

PATENTS. Time counts in applying for patents. Don't risk delay in protecting your ideas. Send sketch or model for instruction or write for free book "How to Obtain a Patent" and "Record of Invention" form. No charge for information on how to proceed. Communications strictly confidential. Prompt, careful, efficient service. Clarence A. O'Brien, Registered Patent Attorney, Security Bank Building (directly across street from Patent Office), Washington, D. C. See pages 140 and 141.

66 MILES on 1 Gallon—Amazing new Gas Saver. All autos 1 free. Critchlow, M-132, Wheaton, Ill.

DISTRICT Agents—Sell \$23.50 suits and overcoats, all wool, one price. Wonderful values, liberal commissions in advance; money back guarantee; 9x13 switch outfit free. Write R. P. Harvey, Mgr., Box 90, Chicago.

AUTO owner the agent wanted each locality to use and take orders for hand-made Mellingen cord and balloon tires; guarantee bond 15,000 miles; shipped prepaid on approval; get your tires free; no capital or experience required; make \$100 to \$300 weekly. Write for wholesale prices and sample kit. Address Mellingen Tire Co., Dept. 400, Kansas City, Mo., or Dept. 400, Philadelphia, Pa., or Dept. 400, Oakland, Calif.

TAILORING Agents—Sell Simpson's new \$23.50 virgin wool union made to order suits and overcoats. Commission in advance. Exclusive territory. Big outfit 175 samples free. Write J. H. Simpson, 843 Adams St., Dept. 1225, Chicago.

GREATEST 25c Auto Specialty out. 200% Profit. Brand New. Nothing Like It. Exclusive territory. Free Samples. A. Gandy, 405 Great Northern Bldg., Chicago.

GOLD Leaf Window Letters and Script Signs. No experience; 500% profit. Samples free. Consolidated, 636—West Van Buren, Chicago.

HIGH-GRADE Men or Selling Organizations to handle fast-selling Office Needs. Retails \$2.50. Big margin. Exclusive territories. Metal-Craft Mfg. Co., Minneapolis, Minn.

WHY sell for others? Make your own. Product Book containing 110 formulas, \$1.00. F. Cramer, 20 E. Jackson Blvd., Chicago, Ill.

BIG demand—big profit! Anisol removes grease instantly. Cleans clothing, hats, shoes. Removes gum, tar. Harmless to fabric. Unburnable. Write Claremont Chemical, Suite 405, 500 Fifth Ave., New York.

AGENTS. Handle "Velvo-Clean." Mechanics guaranteed Powdered Hand Soap. Free samples get orders. The Bet-r Products Co., Union City, N. J.

AGENTS make 500% profit handling auto initials, sign letters, novelty signs, etc. Catalog free. Hinton Co., 4317 Homer Ave., East Chicago, Ind.

A DEPENDABLE all-year-round profitable business selling staple line, certified disinfectants, insecticides and cleaners, to homes, hotels, farms and factories. Seacoast Laboratories, Seabright, N. J.

BIG Paying Business—Earn \$50 to \$100 weekly handling the Cox Automatic Screw Driver; every auto owner buys on sight; quick cash sales; small capital starts your own business. Write for free booklet. Mention magazine. S. J. Cox, Franklin, Pa.

AGENTS \$10 Daily—Something New. Abel's Rug Cleaning Powder and Polishing Cloths, fast sellers. Sample each free. Abel Co., 256, The Arcade, Cleveland, Ohio.

TAKE it easy! It's no trick to sell All-Wool, Made-to-Measure, Union label Suits and Overcoats at \$22.50 when fit. Linings, materials, and workmanship are money-back guaranteed. At \$1 a sale, you can make \$100 each 4 or 5 days and take it easy. Free Sample Outfit. State experience, territory, etc. Jay Rose & Co., 411 S. Wells St., Dept. 161, Chicago.

AMBITIOUS Men to sell and install Ideal Corner Dust Shields for stairways; a device that makes housework easier; liberal commission, easy to sell. Ideal Stairway Equipment Co., Canton, Ohio.

GET posted—Good prices paid for butterflies, insects. See Sinclair display advertisement, page 26.

MANUFACTURE—Sell insect exterminator. Formula, etc., \$1.00. Jenkins, Box 1149, Charleston, W. Va.

\$8.50 to \$20.00 DAILY pay. Introducing New Insured Hosiery for men, women, children. 57 styles, 40 colors. Must wear or replaced free. Repeat orders sure. Nyland made \$595 in one month. Edwards, \$160.00. Mrs. Bone, \$145.25. Why not you? Even spare time work should pay you \$3 per hour. Your Pay Daily in advance. We deliver and collect. You spend all your time writing orders. No experience or capital needed. We furnish samples. All grades, colors, including silks. No matter what you are doing now, write for our offer. Macnehee Textile Company, Card 2567, Cincinnati, Ohio.

SOMETHING new. "Kerio" Necktie Pressers remove wrinkles from worn neckties "while you sleep." Big moneymaker. Whirlwind Seller. Particulars free. "Reco," Box 102, Salem, Mass.

AGENTS. Selling Formaldehyde. Make Big Money. Every Household Wants It. Great 50c Seller. Sample, 25c. Particulars Free. Clark Mfg. Co., 1773 Armistice Ave., Chicago.

AGENTS: Good profits. New Idea Advertising. Use the old Silk Hose. Particulars, 10c. C. F. Church, College View, Neb.

AGENTS—Make a dollar an hour. Sell new kind of sharpeners. Sharpens all knives and tools quickly. Demonstrating sample free. Premier Mfg. Company, Dept. 57, Detroit, Mich.

NEW camera finishes regular black and white photographs inside camera quickly. Make money taking photos, selling cameras. Crown, 439 Canal, Dept. 303, New York.

AGENTS can instantly step into Big Income Class helping us supply tremendous demand for Tarnoff—amazing new preparation that magically makes any car look "brand new." Sensational seller wherever introduced. Exceptional opportunity, every locality, for fat profits—all cash—and "flying start" in big-paying business of your own. Speak quick for local agency. Send 50c (coin) today for \$1 size sample, and full details of our highly cooperative sales plan. Tarnoff Chemical Co., 1406 W. 26th St., Cleveland, Ohio.

SALESMEN: Write your name and address on a postal and mail to us. We'll show you sure earnings of \$20.00 a day. Will you risk one minute, and a one cent stamp against \$20.00? Mind you, we say we'll Show you. Address Dept. 893, William C. Bartlett, Inc., 830 W. Adams St., Chicago.

EARN \$30 to \$100 a week taking orders for Furniture and House Furnishings from Catalog on Easy Payments. No experience or capital required. Full or part time. Outfit free. L. Fish Furniture Co., Dept. A-97, 2225 West Pershing Road, Chicago, Ill.

BIG season on. Rhinestones Initial Buckles sell on sight. \$15.00 daily in advance. No investment. Exclusive territory. Chaton Novelty Co., 606 Blue Island, Chicago.

WE pay \$18 a week, furnish auto and expenses to introduce our Soap and Washing Powder. Buss-Beach Company, Dept. A-42, Chippewa Falls, Wis.

AGENTS: \$75.00-\$200.00 weekly. Gold Leaf Window Letters easily applied. Unlimited demand. Free Samples. Lewis Co., 368A, Milwaukee St., Milwaukee, Wis.

KLEENZIT Kleening Pencil—new, different. Instant appeal to housewives and tailors. Sell like hot cakes. Removes spots from clothes without leaving marks or rings. 50c seller—big profit. Write quick. Exclusive territory. Argyle Specialty Co., Dept. P, Argyle, Wis.

SELLING Like Blazes! Eleven-piece toilet goods assortment at \$2.00 with two-piece carving set free to your customers. 100% profit. Davis Products Co., Dept. 58, 1321 Carroll, Chicago.

WE Pay \$50 a Week and Expenses and give auto to men and women introducing our goods. Marlax Co., F20, 4520 Magnolia, Chicago.

AGENTS and Distributors—Make big profits selling toilet preparations and specialties. Write for particulars. Inter City Sales Co., 546 Howard Ave., Brooklyn, N. Y.

MIRRORS Resilvered at Home. Costs less 5 cents per square foot; you charge 75 cents. Immense profits, plating like new; brass, worn-off autoparts, reflectors, tableware, stoves, etc. Outfits furnished. Details free. Sprinkle, Plater, 128, Marion, Ind.

PORTRAITS, photo pillow tops, frames, sheet pictures, medallions, merchants signs, food products, photo jewelry, guaranteed home, toilet requisites, luminous crucifixes. Catalog 50 specialties free. 30 days' credit. Jas. C. Bailey Co., Dept. C-7, Chicago.

IF You Can Sell Ford Tires for \$4 each you can make \$3 an hour as our Local Distributor. Unusual Product—New—Sells like Wildfire. Rubber is high. Tires are up, and going higher. This gives amazing opportunity to make Big Money Quickly—and build permanent business. Good merchandise. No experience or capital required. Full or Part Time. Free Advertising. Free Sample. Territory going fast. Write for Exclusive Territory Now. Dept. C-148, Unusual Products Co., New Rochelle, N. Y.

AGENTS—Sensational Invention! Breaking all sales records! Every home a prospect. \$1.00 commission each sale. Newly patented Hot Water Bottle. Perfect side line. Write G-410, Rubber Corp., Middleboro, Mass.

AGENTS: Make \$10 Daily selling House Dresses and Frocks. Write for free samples and catalog. Economy Sales Co., Manufacturers, Dept. 684, Boston, Mass.

AGENTS: New Patent Just Out! Nothing like it ever sold—makes perfect Buttons in few seconds. Retails \$2. Sells on sight. Women can't resist. Acts, make \$25 per day. Get our free sample offer. The Marvel Corporation, Box 1500, Medina Park, N. M.

AGENTS—\$100 a week for full time; \$25 to \$50 spare time. Equipment and car free. Exclusive territory. Sound, permanent proposition. A rare opportunity, but you must act quickly. Write for particulars today sure. American Products Co., 6005 American Bldg., Cincinnati, O.

AGENTS, write for special offer. \$80 a week and latest model Ford auto. Your pay daily in advance. Extra bonus besides. Introduces finest line guaranteed hosiery. Our silks can't be beat. No experience needed. Samples furnished. We give you extra fine silk hose for your own use absolutely free. Write today. Jennings Hosiery Co., Dept. 1231, Dayton, Ohio.

66 MILES on 1 Gallon—Amazing new Gas Saver. All autos, 1 free. Critchlow, P-132, Wheaton, Ill.

SAMPLE Free—Cutter pin Superpuller. Brand new wonder tool. Sells instantly on demonstration. Want thousand agents quick. Burke & Gantz, 9 S. Clinton, Chicago.

MAKE \$15.00 daily selling "Fixit" Rubber Repair (Liquid Rubber). Doubles mileage of tires and tubes. Sensational seller and moneymaker of 1926. Sample free. Marquette Rubber Co., DD-2327 W. Wolfram St., Chicago.

WANTED State Distributors for White Mule Magazine. Sample copy and full particulars, 15c, Box 139, Brazil, N. Dak.

EASY to Earn \$10 Daily selling our Seven-in-One Vest Pocket Wonder Tool for Radio, Automobile, Electrical or Home use and other like, popular priced specialties. All 100% profit items—and Ready Sellers. Write Today for particulars. G. M. Z. Co., 309 Sixth Avenue, New York.

SHOVEY'S Profits Were \$75 Three Days after receiving sample Morey Rim Tool. His profits for his agents. M. Morey Rim Tool Co., Blissfield, Mich.

AGENTS—Here's a New One. "Best-ever Powdered Hand Soap." Sells like wildfire. Marvelous Discovery. Removes grease, paint, ink, oil, in fact anything from the hands. Cannot harm skin. 150% Profit. Great Repeater. Agents simply colining money. "Free Samples Get the Business." Write immediately. Bestever Products Co., 1937 E. Irving Park, Chicago.

\$31.00 PROFIT—with \$1.50 Outfit—Big Money—Easy Work. Selling Gold Monograms for Automobiles, Luggage, Windows, Wagons. No Experience. No License. "Samples Free." NuLife Monograms, Hartford, Conn.

AGENTS—Free assortment famous brands coffee, spices, etc., 240 fast sellers. \$8.50 daily; \$1.25 hourly spare time. Permanent. Pleasant, dignified work. No experience or capital. Fords to workers, no contest. Going fast. Write quick. Harley Co., G-2022 Harley Bldg., Dayton, Ohio.

THANCO Vanilla — Highest Quality! World's best seller, households, restaurants, bakeries, stores. Price beats competition! Enormous profits! New Plan. Write Thomas Manufacturing Company, Indianapolis, Ind.

WANTED Hustling Agents Distributors. Wonderful Auto necessity. Sells for \$2. Profit \$1.33. Every owner wants one. Write quick. Wilman Co., 2225 Vermont, Toledo, Ohio.

"GREEN Arrow" Glare Shields make you \$12.50 daily. Motorists quickly buy this "wonder protector." Exclusive sales plan free. Franklin Company, 1131 Kasota Building, Minneapolis. Sample, 50c.

ARE you old at forty? See our advertisement on page 26 of this issue. The Electro Thermal Company, 2159 Main St., Steubenville, Ohio.

AGENTS: Signs. Something new. Big profits. World Signs, 108 North Dearborn, Chicago.

SEE our advertisement under High Class Salesmen. Police Machine Co.

\$18 DAILY selling "Lanowa" Polishing Cloth and Mittens Dusters. Great repeaters. Tremendous demand. Appoint agents. Free sample. Fraser Products, 303-J, 43rd, Kansas City, Mo.

MILLIONS buy it. Make and Sell inexpensive staple, spare time, at home. Big profits. Get descriptive folder today. Homer Grondyke, 220 Wynn Bldg., Monroe, Ind.

BEST seller in twenty years. Johnson makes \$12,000 yearly. New men \$5,000 m. Exclusive territory. Write quick. Surety Mfg. Co., 26A W. Washington, Chicago.

AUTOMOBILE Trouble, Spot, Camp, Emergency, Driving and Tail Light, with Vacuum Cup Base, Firmly Sticks Anywhere, Fills Universal Need. Every Automobilist Positively a Big Prospect. Sample Two Dollars, Literature Free. Greatest Seller Convertable for Agents. Vacufile Company, Santa Monica, Calif.

FREE sample. Fastest seller today; sells 35c, profit 27c. Sell 10 an hour easy. Superior Specialties, Box 553A, Springfield, Ill.

DUSTLESS. Cyr-Row Mystery Auto Cleaner. Patented finish preserver. Use once, then polish all season with water. \$1 can, Postpaid. Agents Wanted. Cyr-Row, Green Bay, Wis.

FORDS—Fordsons! No Boiling! Cools, Fuels, Decarbonizes! Beats any gas saver. Cheap, practical, thoroughly tested. County distributors wanted. Salesmen, mechanics, Ford owners make \$100.00 per week this summer. Airlock Products, Long Beach, Calif.

MEN and **WOMEN**! Extraordinary advantages selling new, exclusive guaranteed line. No competition. Demand everywhere. Experience unnecessary. Part or full time. Write Dept. 151 for free outfit. Modex Company, 246 Fifth Avenue, New York.

\$35.00 **PROFIT** on \$1.50 Outfit! Gold Transfer Monograms for Automobiles. Free Samples. National, Station D, Brooklyn, N. Y.

EASY money applying gold initials, monograms on automobiles. Anyone can do it. Simply transfer from paper. Charge \$1.50, cost \$0.60. Samples and information free. World Monogram, Dept. 25, Newark, N. J.

BURGLAR Alarm—Returns \$1.00. Three to twelve to home, \$1.00 sample allowed on first dozen. Three screws; patent. Surprise Burglar Alarm Co., 940 N. Orange Grove, Pasadena, Calif.

SELL, Oriental Perfumes—Biblical Bouquet, Hindu Rose, Flot-Atmos, Bokul—and make 100% profit. Bonola Parfumerie, Inc., 111 Bonola Bldg., 2934 Michigan Blvd., Chicago.

\$75-\$100 **WEEKLY**. Attractive proposition. Territories now allotted. Write at once. Linetin Hosery Corporation, 1132 Broadway, New York.

AMAZING Large Cash Commissions Introducing Beautiful \$8.95 and \$4.95 Fit-to-Measure Guaranteed Shoes. Actual Samples Furnished. Write for Your Territory. Style Arch Shoe Co., Dept. 129H, Cincinnati, Ohio.

GENUINE Gold Leaf Letters anyone can put on Store windows. Guaranteed to never tarnish. Large Profits. Enormous Demand. Free Samples. Write today. Metallic Letter Co., 438-A North Clark, Chicago.

MAKE \$75.00 a Week and Up, selling our fine made-to-measure, all-wool suits—Direct to wearer—all one price, \$31.50. Biggest values. Commissions in advance. We deliver and collect. 6x9 swatch samples furnished. Write today. W. Z. Gibson, Inc., Dept. C-517, 101 W. Harrison St., Chicago, Ill.

AGENTS Make 150% Profit Selling the "C-B-CO" Jar Cap Sealer and Opener (for Mason Jars)—a household necessity—nothing like it. Nelson sold 7 gross in March, working part time. Tillman often sells 2 gross a day at fairs. Sells on sight. Send 50 cents for Sample, postpaid, or 25 cents if you send this Ad with order—50 cents without the Ad. Stamps accepted. Send for sample and full particulars today. Comstock-Bolton Co., Dept. 69, 335 Southwest Blvd., Kansas City, Mo.

HERE'S the line that satisfies—you'll sell yourself on sight. New Rubber Specialties for every purpose. Over fifty fast sellers needed in every home; honest goods that we guarantee and the profits are large enough to give you a steady income and make you stick the year round. Write B. & G. Rubber Co., Dept. 921, Pittsburgh, Pa.

DRIVER agents wanted to sell our line of fast selling auto accessories. Pike Laboratories, Inc., Newaygo, Mich.

\$1 PER hour selling Dirt-Solvo Washing Powder. Big repeaters; exclusive territory. Premiums for customers. Sample free. Goodspeed Products Co., Rutland, Vt.

LOOK!—Write quick for sample and particulars. Wauver-Glo Hairbrushing; enclose 10c postage. N. Abbott, 3 Smith St., Court, New Bedford, Mass.

SALESMEN—Are You Making Enough Money? Let us show you how to make Big Profits with Jiffy Washing Tablets. No experience required. Write for Free Sample and Plans. Jiffy Soap Products Co., Dept. A, Dayton, Ohio.

YOU can be your own boss with our Key-Check outfit. Good for \$2 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 20 cents. Please Die Works, Dept. M, Winchester, N. H.

DISTRIBUTORS To Sell Retail Stores and Hire Agents. Exclusive territory. Article retails for one dollar. Attractive display carton holds twelve. Strong appeal to motorists. Protecto Shield, Inc., 156 Edinboro St., Boston, Mass.

AWAY Ahead of Every Thing Else! That's "Zippo" as a seller. Show your sample, talk a minute and pocket your profit. A real Sure-Fire, He-Man Money-Getter that repeats—and say, boy, it actually sells on a ten second Show-Down. If we didn't know we had a proposition that any man could sell eight out of every ten calls, you can bet your sweet life we wouldn't spend money telling you about it. Karan-Smith, 607 F Street, Ft. Wayne, Ind.

AGENTS—\$30 a Week—\$2 to \$5 an hour spare time. Make this with the celebrated line of Ho-Ho-Co Soaps, perfumes, toilet articles and specialties; over 200 items. Big profit makers. La-Em-Straff Hair Dressing selling like hot cakes. Write for Free Sample Case offer. Ho-Ho-Co Mfg. Co., 187 Ho-Ho-Co Bldg., St. Louis, Mo.

STOP Daily Grind. Make big money in a business of your own. Local or Mail Order. Experience unnecessary. Circular free. Write today. S. Viggiano, 221 Larimer Ave., Pittsburgh, Pa.

STARTLING Selling Plan! \$1.25 premium free to every customer on \$2.00 sale of 8-ounce Vanilla, 6-ounce Shampoo and 4-ounce Lemon Lotion. Details and samples free. C. I. Togstad, Dept. 18K, 29 South Clinton, Chicago, Ill.

\$50,000. **PICTURE** Man Friedman made canvassing. Beginners can make \$100.00 weekly with my sales talk. Experienced men make more. Free book, "Profits in Portraits" explains. Samples Free. Picture Man Friedman, Dept. 83, 541 W. Lake, Chicago.

NEWEST Invention! Sells everywhere. Automatically prevents telephone and iron cords from tangling and kinking. \$30 weekly. Samples for tests if desired. Necerknot, Dept. 1-1, McClurg Bldg., Chicago.

AGENTS, Salesmen—Sell New Thermostatic Automatic Carburetor Control Attachment for Fords. Big profit, full or part time. Burns 85% alt. Doubles Mileage. Attached in 2 minutes. No drilling. Does automatically exactly what Ford manual says do by hand. Cadillac now using Thermostatic Carburetor Control under Blancko Brouse. Write today. A. C. Blancko & Co., Dept. 805KX, 602 Lake St., Chicago.

66 MILES on 1 Gallon—Amazing new Gas Saver. All autos, 1 free. Critchlow, N-152, Wheaton, Ill.

FREE—Get This Quick! Chicago's Wonder Shirt line. Sell newest, stylish, snappy, Stylemor Shirts. Amazing values at low prices. Make \$100.00 weekly easy. Complete assortment of large swatches makes selling Stylemor Shirts a cinch. Experience or capital unnecessary. Be your own boss. We will show you how to build a big business of your own. We will deliver and collect. Exclusive territory open. Write today for big free outfit. Stylemor, 81 W. Van Buren, Chicago Ill. Dept. 1006.

AGENTS—\$85.00—\$125.00 weekly. One man made \$85.00 one day selling famous Studebaker 21 Jewel Watches direct from factory. Easy Payments. Latest thin model. Outfit free. Full or part time. Write today. Studebaker Watch Co., Dept. C373, South Bend, Ind.

MARVELOUS Invention! Does away with phonograph needles. Preserves records. Save \$25 in needles. Pays \$30 weekly. Sample on approval if requested. Everplay, Dept. B-7, McClurg Bldg., Chicago.

AGENTS, both sexes, we manufacture and control new household article. Fast seller. Big profits. Exclusive territory. Write now. Connally, 123 Liberty St., New York.

OUR Luminous Crucifix Shines in the Dark. Every one amazed at the wonderful effect. Easily demonstrated. Easily sold. W. G. Hannan Co., Dept. B, 2539 So. State St., Chicago.

AGENT makes \$37 a day driving nails in trees! Amazing discovery heals all punctures—one tire was punctured 857 times without a leak. Send for free Sample Offer. O. S. Nelson, H-3025 Logan Bldg., Mitchell, S. Dak.

AGENTS, our super-embossed display signs for all stores are tremendous sellers. \$5 to \$100 per week easily made. Write now for details. Artistic Signs, 709-B Broadway, New York.

\$8.00 TO \$16 daily easy. Introducing "Chieftain" Fine Quality, Guaranteed Tailored Shirts. Just show samples, write orders. We deliver and collect. Your Pay Every Day. No capital or experience necessary. Spare time pays you big. Send today for Free Samples. Cincinnati Shirt Company, Secy, 1587, Cincinnati, Ohio.

BUILT splendid business making chipped glass number and name plates, signs, checkerboards. Write for particulars. Simplex Utility Co., 1133 Broadway, New York.

FORMULAS—All Kinds. Catalog Free. Clover Laboratories, Park Ridge, Ill.

AGENTS: Millions of motorists eager buyers. New patented "Anti-glare," fits over eyes, prevents accidents, wrecks, saves lives. 100 to 200% profit. \$20 daily easy. Write quick. Fairmont Opt. Mfg. Company, 305 South Street, Waltham, Mass.

\$12 DAILY Easy (Swore Proof) Introducing New Style Guaranteed Hostess. Cotton, Ilse, chifon, silk. Latest colors. Harvest, Frechmude, Orchid, Fawn, Blush, 33 others. You take orders. We deliver and collect. Samples furnished. Send for Proof of Profits. M. H. Mathews, Card 5867, Cincinnati, Ohio.

MILLIONS stolen. Remarkable new \$5.00 Check Protector stops forgery. Inks, protects two colors. Sensational sales, profits. Write. Safety Devices Corp., Grand Rapids, Mich.

AGENTS—Big Seller—\$20 a Day Easy selling Taylor Caps—made-to-measure—every man buys—some want 2 or 3 caps. Samples Free and Cap Free to good agents. Write quick for fast money making proposition. Address Taylor Cap Manufacturers, Dept. H-145, Cincinnati, Ohio.

DO you want good live agents—fellows who can get the business? Ask me how others are doing it. I'll gladly render the necessary assistance without cost to you. Address, M. L. Hund, Mgr. Classified Advertising, Popular Mechanics Magazine, Chicago.

GOLD Sign Letters. \$9.75 for Thousand. Non-Tarnishable. Free Sample, Catalogue. Full Sign Works, 438 Broadway, Denver, Colo.

AGENTS Get our proposition selling United No-Cement Tube Patch. United Patch Company, Corington, Ky.

MANUFACTURER lamb wool polishers, dusters. Newhall, 338 Broad St., Lynn, Mass.

MAKE Big Money selling our household necessities. Real money makers. Every housewife will buy. Particulars free. Snell Products Co., 1021 State Ave., Cincinnati, Ohio.

STARTLING New Invention for the lawn. Medicine Bottle for the Lawn and Garden. Turns water to medicine for the lawn. Yet uses only water. Attach it to a hose, turn on the water, and watch the crowds gather to see what's going on; makes water roll up like a smoke bank. Gets 'em all. Takes the place of Sprinkler; everybody buys. Sells for only \$2.00. Agents make half and more. Selling by the thousands. Nothing like it. To save delay send one dollar for Agent's sample. Write for our proposition. Lawn Inventions Company, La Crosse, Wis.

AGENTS—\$10.00 to \$20.00 daily selling new attractive glass novelty signs. Complete line for every business. Write Modern Sign Works, 900P No. Wells, Chicago.

HIGH Profits with Exclusive Territory—\$50 to \$100 weekly easy. More has often been made in one day's work. A hot or cold running water bath equipment for any home at only \$7.50. No plumbing or water work required. Investigate. Send no money. Write today. Sanitary Supply Co., 709 Allen Building, Toledo, Ohio.

LIBERAL, Commissions Selling New Games and Toys. Samples. Wholesale. Cardinal, Mo. Chair, N. J.

WASH Clothes the new way. Use the Torrent Automatic Washer. You will be delighted. Special offer to one in each locality. Storm Royalty Co., 3601 Eastgate Ave., St. Louis, Mo.

WANT distributing agent for Hanslick, powdered handsoap; removes anything from the hands without injury to skin; everybody a customer; great opportunity for hustler to get in business; sample free. Solar Products Co., A2144 So. Troy, Chicago.

\$50.00 WEEKLY, Pleasant Work, applying Gold Initials on Automobiles. \$1.45 profit every \$1.50 Job. Experience unnecessary. Free Samples. "Kaleo" Monograms, 1043 Washington, Boston, Mass.

MAKE your auto look like brand new. Dri-Klean-It removes mud, dirt, dust. No soap or water used. Write for sample. Agents wanted. American Accessories Co., Dept. 231, Cincinnati, Ohio.

AGENTS—Best seller: Jem Rubber Repair for tires and tubes; supersedes vulcanization at a saving of over 800 per cent; put it on cold, it vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube; sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Philadelphia, Pa., Dept. 505.

HAVE You Anything to Exchange, Buy or Sell? Send list describing everything, price asked if for sale, or article wanted in trade; may find you customers. Market for Exchange, Rm. 718, 88 Broad St., Boston, Mass.

BIG Money monogramming autos, trunks, bags, etc. Make \$20 to \$25 daily. No experience needed. Samples, information free. Monogram Co., Newark, N. J.

WHAT is it that eliminates indigestion, retains health, returns ill health to normal, prolongs life, is not a medicine, and is a household necessity? Agents Wanted. Ask Dundee Mfg. Co., Inc., 157 Summer St., Boston, Mass.

EVERY Autoist will buy Auto Mitten Dusters. Send for Particulars and Free Sample. National Fibre Broom Co., St. Louis.

CALIFORNIA Rosebeads selling like hot cakes. Agents coming money; new stuff. Big profits. Catalog free. Mission Factory PM, 2328 West Pico, Los Angeles, Calif.

AGENTS—Write for Free Samples. Sell Madison "Better-Made" Shirts for large Manufacturer direct to wearer. No capital or experience required. Many earn \$100 weekly and bonus. Madison Company, 566 Broadway, New York.

REMNANT Store, Bethel, Ohio. Greatest Dry Goods Bargains on Earth. Agents and Dealers.

A BUSINESS of Your Own—Making Sparkling Glass Name and Number Plates, Checkers, Signs, Big Book and Sample Free. E. Palmer, 512 Wooster, Ohio.

MAKE very latest Guaranteed Products—300 to 1,200% profit using Miller's Tested Manufacturer's Formulas—Stamp brings Valuable, Interesting Literature, explaining how others sell your goods—No machinery—investment small—all lines. Information Guaranteed Reliable. Miller, Chemist 1706-S Jetton, Tampa, Fla.

DIRECT factory representatives for changeable-letter window-display signs. Good income assured. Experience unnecessary. Samples free. Maze Manufacturing Co., Dept. PA, Norwood Station, Chicago.

\$10 A DAY guaranteed. Home work. Send stamp for particulars. Dept. 15, 1138 S. 7th St., Camden, N. J.

SUCCEED With Your Own Products—Make them yourself. Formulas, Processes, Trade-Secrets. Modern master methods. Catalog free. B. Thaxby Co., Washington, D. C.

ORANGEADE, in powder—just add cold water—most delicious drink you ever tasted. Fine for home, parties, picnics, dances, etc. Start in this business—big money easily made. Send dime for ten glass package, postpaid. 7 kinds. Cherry, Grape, Lemon, Strawberry, etc., for 70 glasses only 50c. postpaid. Morrissey Company, 4417-25 Madison St., Chicago.

SELL guaranteed shirts, overalls and work pants. Big variety of shirts, including silks, with a splendid line of union made work and flannel shirts, overalls, coveralls, work pants, play suits, all guaranteed. Sell direct to wearer full or spare time. No experience required. Write today for Free Selling Outfit. Nimrod Shirt Co., Dept. S, 4929-24-26-28 Lincoln Ave., Chicago.

AGENTS—Wonderful seller, new discovery. Auto Rubber Repair for tires and tubes. Superior to vulcanizing. Put on cold at very little cost. Outlasts tire or tube. Sells to every auto owner and accessory dealer. Agents if you want big profits, made quick, write for particulars and free sample to Waltham Rubber Co., 13 South St., Waltham, Mass.

MAKE Your Name Pay Dividends. Sell "Results" polishes and cleansers under your own private label. Every article a leader and business builder. Your name on package controls territory. You get all repeats. Just the thing for Crew Managers. Sub-agents must buy from you. Housewives buy and use "Results" because they get results. So will you. E. N. Norris, 97 E. Fulton St., Bloomfield, N. J.

FORMULAS for making your Guaranteed products. All Lines. No Machinery, 300 to 1,200% profit! Stamp brings interesting descriptive literature—Instant Fly-Killing Spray; Delicious Summer Drinks, Best Metal Polishing Cloth, No-Water Hand Soap, Lightning Battery Charger, Mendit, Fabric Patching Liquid, Amazon Tire Weld, Wonder-gloss Shoe Polish, Radiator Repair Liquid, Queen of Soaps. Many others—all lines. State what interests. Highest references—Miller, Chemist 1706-O Jetton, Tampa, Fla.

50c TO \$1.00 profit each sale. No delivering, license nor stock necessary. Bonanza. Free particulars. Mission Factory 519PM, 2328 West Pico, Los Angeles, Calif.

66 MILES on 1 Gallon—Amazing new Gas Saver. All autos. 1 free. Critchlow, 0-122, Wheaton, Ill.

COST \$7.50. Your profit \$312.00.. Transferring decoupage letters on autos, trunks, bags, etc. Send today for outfit or free samples. Monogram Co., Newark, N. J.

"LIQUID-LEATHER" Fills Holes In Shoes, Rubbers, Tires. Dries Instantly. Pliable. Waterproof. Just imported from France. Tube Retails 50c—Cost 25c. Sells Housewives, Sub-Agents. Nulife Leather, Hartford, Conn.

AUTOMOBILE Specialties. Guaranteed formulas for all latest money makers. Lowest prices. Write for free lists. Murphy, Chemist, Tujunga, Calif.

MAIL-ORDER Houses and Distributors: We pack French made beauty creams, face powders, perfumes, toilet preparations with your label. Chemist. A2700 Wabash Ave., Chicago.

AGENTS: Full or spare time—to sell hand baited scars, doilies, pillows. Extremely low priced. A wonderful new process. Our agents are cleaning up. Paintographs practically sell themselves. Write for full particulars of liberal agency offer, and circulars describing Paintographs today. Bradfords, Dept. 60A, St. Joseph, Mich.

BIG Money Selling New Household Cleaning Set. Washes and dries windows, Sweeps, scrubs, mops. All complete only \$2.50. Over half profit. Write Harcer Brush Works, 172 3rd St., Fairfield, Iowa.

MAN in each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Aie. H. Decatur, Ill.

WE Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., Dept. 2480, St. Louis.

AGENTS—\$60 to \$200 weekly putting up our Burnished Genuine Gold window letters; scripts. Experience unnecessary. Free samples. Premier Letter Co., 121 N. Francisco, Chicago.

GIVE Away finest laundry soap Free. You'll make \$10 daily easy by new selling plan. Big repeat business. Write quick. Wolverine Soap Co., 28 Wolverine Bldg., Grand Rapids, Mich.

AT LAST! Diamond Rival Discovered! Amazing blue white Rajah Gem astounds jewelry world and deceives experts! Beautiful Sample case Free! \$100 weekly! Write Quick! Rajah Diamond Co., Dept. F-7, Salisbury, N. C.

SELL by mail! Big Profit! Books, Formulas, Novelties, Bargains. Particulars Free! Elco, 523 South Dearborn Street, Chicago.

AGENTS: 500% profit. "Happy Home Maker Shampoo" builds your own big business. Martin of Indiana made \$75.00 in one day. Missouri man made \$750.00 in month. Exclusive territory. Geo. A. Schuldt & Co., Dept. P, 236 W. North Ave., Chicago.

AGENTS \$1. Retails \$3. Your Profit \$2. Wonderful pocket Adding Machine with Magic Writing Pad. Particulars Free. Typewriter Supply, 905 Hersh Bldg., Pittsburgh, Pa.

WILLIAMS' No-Water Hand Soap, tubes, has taken Auto owners by storm; washes dirtiest hands perfectly clean without water; easy demonstration makes quick sale. 150% profit. Williams Co., Dept. 265 Montclair, N. J.

A \$5,000 A YEAR Job. You can make it worth that and more. 100% to 600% profits selling Perry Photo Medallions. No portraits so desirable. Indestructible, hand-colored, fade-proof. Built from photo supplied by customer. Guaranteed. No money risk. No margin of profit so big in any other line. Write. Perry Photo Novelty Corp., 1793 Jerome Ave., Dept. PM, New York.

AGENTS make \$3.00 an hour taking orders for our 40 Fascinating Kitchen Specialties. No competition. Write quick. General Products Co., Dept. 7K, Newark, N. J.

FIBRE Brooms—detachable handles, fine finish. Good profits, repeat sales. The Fibre Broom People, 147 New Jersey Ave., Brooklyn, N. Y.

BIG Money and Fast Sales. Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

AGENTS—Clever Invention! Inkspoon makes every pen a fountain pen. Fast office seller: big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marul Company, Tribune Bldg., New York, N. Y.

EASY, pleasant work for Mechanics. Shop Men, Clerks, during spare hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

AGENTS—N-R-G Laundry Tablets, the old reliable moneymaker for live agents. Millions sold—200% profit—sales waiting for you. Clothes washed spotlessly clean in 10 minutes without rubbing. Free samples. N-R-G Company, 230 W. Superior, Chicago.

GENUINE Gold Leaf Letters anyone can put on Store windows. Guaranteed to never tarnish. Large Profits. Enormous Demand. Free Samples. Write today. Metallic Letter Co., 438-A North Clark, Chicago.

AGENTS make \$100 week placing advertising Cigar Lighters with glass front. Every dealer wants one. Write for free plan. Drake Mfg. Co., Dept. M, Milwaukee, Wis.

REPLATE brass, worn-off Automobile parts, Reflectors, Bath Room Fixtures, Worn Spoons, Forks, etc., with pure silver. Looks like new. Use U-Kan-Plate Polish. Positively no mercury. \$1.00 half price postpaid. Satisfaction Guaranteed. Agents wanted. Dept. A, U-Kan-Plate Co., Philadelphia.

AGENTS—Make a dollar an hour. Sell Mendets, a patent patch for instantly mending leaks in all utensils. Sample package. Collette Mfg. Co., Dept. 404, Amsterdam, N. Y.

BUSINESS Guide with Free Legal Service. Sells everywhere; Wells cleared \$1,185 in 35 days. Write for free outfit. Nichols Co., Naperville, Ill., Dept. 4B.

\$5,000 **YEARLY** easy, selling our money-making specialties; we undersell them all. Catalog free. Samples 25c. Mills Sales Co., 13 East 16th Street, New York.

PORTRAITS, photo pillow tops, frames, sheet pictures, medallions, merchant's signs, food products, photo jewelry, guaranteed hose, toilet requisites, luminous crucifixes. Catalog 50 specialties free. 30 days' credit. Jas. C. Bailey Co., Sta. C, Chicago.

GET Our Free Sample Case—Toilet articles, perfumes and specialties. Wonderfully profitable. La Derna Co., Dept. A, St. Louis, Mo.

POLMET—The Wonderful Polishing Cloth that cleans all metals without liquid, paste or powder. Approved by "Good Housekeeping" and "Modern Priscilla"—sells fast at 25c. Sample free. Gale & Co., Inc., 15 Edinboro St., Boston.

FREE Booklet describes 52 plans for making \$20.00 to \$100.00 weekly in home or office business of your own. Downs Co., 2223A Myrtle, St. Paul, Minn.

BIG Money—fast sales; everyone buys gold initials for their autos; sell \$1.50 profit \$1.44. Ten orders daily easy. Samples, information free. World Monogram, Dept. 16, Newark, N. J.

EARN \$10 daily silvering mirrors, plating and refinishing metalware, autos, chandeliers, bedsteads, headlights. Outfits furnished. E. Decie Laboratories, 1133 Broadway, New York.

AGENTS: Big Money Monogramming by Transfer Method. Catalog Showing Over 50 Styles and Particulars Free. Motorists' Accessories Co., Mansfield, Ohio.

AGENTS: Our gold-eyd Needle Cases are wonderful sellers; immense profits; \$50 to \$300 weekly; proof and particulars free; sample outfit 15c; factory prices. Paty Needle Co., 231 Davis Square, Somerville, Mass.

AGENTS—Sell 5c fast selling candy specialties to stores. Big profits. Lorrae Products Co., Albany, N. Y.

INSTANT Weld. Repairs largest punctures without cement or heat. Lenn's profit one day, \$56. Write quick. Free sample; territory going fast. Tourists' Pride Mfg. Co., Desk T, Minneapolis, Minn.

OVER 100% Profit. Self Lighting Gas and Cigar Lighters; Everybody interested, repeat business. Sell individuals, dealers, subagents. Particulars Free. P. Bernhardt, 127 West 30th St., New York.

SOMETHING New—"Handy Packet." An attractively put up package of useful household necessities. Positively a sale in every home; fine side line; big profits. Send for sample. Prentiss-Lee, 145 East 23rd St., New York.

NOW that you have read all these offers, read Macchesi Company (Chatl. O.) advertisement again.

HIGH GRADE SALESMEN WANTED

SALESMEN: Galacite, the most successful patented puncture-proofing compound for auto tires, is making \$5,000 to \$10,000 a year for our hundreds of authorized representatives. Sells to car owners and dealers in big quantities. Seals any puncture instantly and makes tire puncture-proof for life. Positively guaranteed. Backed by a large, well financed corporation of long standing. Complete elaborate outfit and extensive advertising co-operation ready to back you in your community. The best money-making proposition ever offered you. Write at once to C. F. Johnson & Co., 19 West Jackson Blvd., Dept. 151, Chicago.

SALESMEN—Get this big sensational order-getting shirt outfit free. Sell Stylemor Shirts all year round. It's Chicago's Wonder shirt line. Advanced Spring Show- ing of smartest, snappy patterns. Large double swatches, low prices, quick service, makes shirt selling easy. Bellard of Texas made \$16.00 in two days. We deliver and collect. Write today for big free outfit. Stylemor, 51 W. Van Buren, Chicago, Ill. Dept. 1106.

FREE deluxe selling outfit—big commissions—valuable prizes—"immediate" bonus—six prizes that meet every purpose—guaranteed label sewed into every coat. Make good money selling this tailored-to-measure line at \$10 to \$15 below local tailor prices. High quality, all wool, perfect fitting garments—\$18.50 to \$45.50, 200 distinctive cloth samples. Positive 8-day tailoring service. Protected territory. Free advertising. Side line of fine neckties and raincoats at surprisingly low prices. Experience unnecessary—we teach you "how." Write all about yourself, giving two business references. Wholesale Direct Tailors, 1205 Ellcott St., Buffalo, N. Y.

SALESMEN—\$20 daily selling a staple guaranteed product that millions use. Elco Aspirin Tablets sell to general merchants everywhere. Most attractive "Silent Selling" counter displays on the market. Retails 12 tablets for 10c; meets all competition, 100% profit each for merchant and salesmen. The largest seller in years; enormous repeat business. Permanent em- polyment or side line. Ford Auto Bonus. Elco Products Corporation, Dept. A, Washington, D. C.

SALESMEN Wanted—To interview furniture and department stores in their locality on a special proposition for reliable manufacturer. You can earn \$100 a week or more in full or spare time on commission. Interesting, steady work. Write today for full particulars. The Marvel Company, Dept. P, Hammond, Ind.

GOLD Leaf Window Letters and Script Signs. No experience; 500% profit. Samples free. Consolidated, 69V—West Van Buren, Chicago.

SELL Window Display Cartoons. Store- keeper's Sales Boosters. Retails \$1. set 12. Commission 15%. Order taking sample 50c. Business Building Cartoons, 23 Beaver Street, New York.

FORDSON Accessory Salesmen with car. Call on Ford Dealers to sell the Ercrol Fordson Oil Pump. Every dealer a sale. We deliver and collect. Nationally Ad- vertised. Polcer Machine Co., 2257 West Austin Ave., Chicago, Ill.

65 MILES on 1 Gallon—Amazing new Gas Saver. All autos, 1 free. Critchlow, R-122, Wheaton, Ill.

DRUG Store Salesmen—Can You Sell \$4.20 easel dozen Hairkurl for \$2.10? Territory going fast. Roussel Laboratories, 779 Hippodrome Annex, Cleveland, Ohio.

MR. JIRUSHI Salesmen—Old Established New York Brush Manufacturers require the services of men in all territories to sell their extensive line of Sanitary Twisted in Wire Brushes. We pay larger commission than any other Brush House in the country. Write immediately for our proposition. Wire Grip Sanitary Brush Corporation, 15 Mercer Street, New York.

A **WHIRLWIND** seller—something new and unique. Radiopexis—nothing else like them—large profits! Write today. Hejomal, 5054 Calhoun St., Ft. Wayne, Ind.

SALESMEN: Sideline Men Wanted to sell line of Printed Watermarked Bond Stationery and Blotter Cards. We pay higher commissions—45%, give quicker service. Salesmen making \$50 to \$100 per week. Free Salesmen's Outfits. Merchant Printers, Box 416, Minneapolis, Minn.

10c PROFIT on \$1.00 Sale. Auto, Furniture and Glass Cleaner. Your Name on Label. Exclusive Rights—Free Sample. H. Mts., 212 Griswold, Detroit, Mich.

BUILD your own business selling CH- max Furnaces, Stoves, Ranges. Exclusive Agency. Sixty years' business. 250,000 satisfied users. Send for catalog No. 22. The Taplin-Rice-Clerkin Company, Akron, Ohio.

DISTRIBUTORS wanted for Mystifying Radio Gas Lighters and Masterlite Cigar Lighters. Everybody interested. Sell to consumers, dealers. Big profits. Steady business. Selling plans free. M. Masterlite Co., 110 East 23rd St., New York.

THIRTY-SEVEN Dollars commission on each contract placed. Have unusual opening for few high class men. New Idea Radio Mfg. Co., 715 Baltimore Blvd., Chicago.

DISTRICT Salesman: Must be reliable. Prefer married man, 30 years old or over, and permanent resident in his community. Exceptional opportunity for good man. Address Dept. 882, William C. Bartlett, Inc., 571 W. Adams St., Chicago.

SELL Groceries Under New Plan. Wholesale prices direct to the customer, quality guaranteed. Sure repeat business. Earnings \$85 to \$125 per week with no capital required. Good the year round. Send quick for free instructions to The E. C. Harley Company, Department E-2012, Dayton, Ohio.

A PAYING Position Open to representative of character. Take orders shorts- leathers direct to wearer. Good income. Permanent. Write now. Tanners Shoe Mfg. Co., 5410 C St., Boston, Mass.

SELL Men's Shoes direct. \$50 to \$100 weekly. Every man a prospect. Easy sales. Low price. Real comfort, long wear. You take orders, keep big deposit. We deliver and collect. Full or part time. We help you succeed. Easywear Shoe Company, Dept. 229, Indianapolis.

SALESMAN—Full or part time for accident and health insurance. Full coverage policies. Liberal commissions. Federal Casualty Co., Detroit, Mich.

SALESMEN—To sell full line Paints, Varnishes, Real Coatings and Murphy's Oil Soaps on commission basis. Experience not necessary. Large commissions. The Phoenix Oil Co., Paint Division, Dept. B, Cleveland, Ohio.

SELL Printing. Low prices. High quality. \$1.00 per thousand commission. Send for outfit. Ozark Press, Joplin, Mo.

CIGAR Salesmen, only four sales daily makes you \$300.00 monthly. Giving leather travelling bag free with only 4 boxes cigars. Bag 372, Watertown, Wis.

BECOME Your Home Town's Leading Business Man. Big money. Easy work. Selling groceries, coffee, canned goods, auto oils, men's shirts, ladies' hoseery direct to consumer. Undersell competition. Commission advanced. Liberal credit plan. No experience or capital necessary. Lovin- & Brown Co., 1775 So. State, Chicago.

MINUTES Pay Dollars demonstrating wonderful three pound Calculator. Retails \$15.00. Work equals \$300 machines. Adds, subtracts, multiplies, divides automatically. Five year guarantee. Big demand: large profits, experience unnecessary. Write quick for liberal trial offer and protected territory. Lightning Calculator Co., Dept. F, Grand Rapids, Mich.

SALESMEN—Become Independent. Own Your business, experience unnecessary selling our \$7,500.00 Accidental Death; \$50 Acci- dent; \$25 Sick Weekly Benefits—\$12.50 Yearly. Other Amounts proportionate. Guaranteed steady income from renewals. \$250,000 Deposited Insurance Department. Universal Policy, Dept. A, 30 Clinton St., Newark, N. J.

FOUR \$7.50 sales to merchants net you \$20.00 daily. Sayers Systems, 2803 Shef- field Ave., Chicago, Ill.

TRAVELING Salesmen calling on retail stores wanted by large manufacturer to sell unique line of business-boosting articles. Year round, fast selling, main or side line. If not earning \$150 weekly, address Union Specialty Works, Inc., 222 Charles St., Rooneville, N. Y.

CALIFORNIA Rosebuds selling like hot cakes. Agents coining money. Absolutely new. Big profits. Catalog free. Mission Factory 81, 2328 West Pico, Los Angeles, Calif.

WANTED—Tailoring Salesmen, make \$80 to \$125 per week. Biggest merchants in many towns have started with our line. We are the largest made-to-measure tailoring house in the country, furnishing elaborate sample equipments, including 500 all-wool fabrics. You make your own profits from \$8.00 to \$15.00 on each order. Guaranteed absolute satisfaction, perfect fit, best workmanship, or no sale. Write for our line and all accessories to be sent free. Tell us all about yourself. Address N. O. Perry, Sales Manager, Box 482, Chicago, Ill.

SALESMEN—Selling Supreme Shirts means big business, big repeats, big commissions. Write today for Free Kit. Supreme Shirt Co., 276-m Fifth Ave., New York.

YOUR trade uses salesboards. Make up to \$35 on single sale. Largest, lowest priced line. No samples to carry. Elab- orate 3-color catalog free. Lincoln Sales Co., Dept. D, 9 So. Clinton, Chicago.

TAKE orders for coffee, sugar, flour, meats, canned goods, staple groceries also paints, radio sets, tires, auto and tractor oils. No capital or bond required. We deliver and collect. Permanent business. Big pay. Write at once. Hitchcock-Hill Co., Dept. 50, Chicago.

\$60-\$200 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

EASY Selling Specialty. Beautiful At- tractive, Appealing. Luminite Window Bulletin. Increase merchants' business 50% to 100%. Protected territory. \$8 commission on each \$20 sale. Thousands being sold; sells itself on demonstration. Display Products Co., Ltd., A 210W Eighth St., Kansas City, Mo.

IF you think in terms of \$6,000 the First Year write Us Now. Strong line for retail stores. Nationally advertised. Established concern. Best season now starting. Liberal weekly advance to producer. The Continental Co., 1300 Liberty Bldg., Cleve- land, Ohio.

SELLS for \$9.75. Prints ad on wrap- ping paper, envelopes, etc. \$4.00 com- mission. Send 10c for sample work. Automatic Ad-Stampers, Joplin, Mo.

SALESMEN Can make \$5.00 a day sell- ing our Calendars, Pencils, Signs, Advertising Novelties, Yardsticks, Whistles, etc. Liberal terms. Sells entire year. Fine side line. Local and travelling agents. Model Calendar Co., Dept. 226, South Bend, Ind.

HELP WANTED

BUILD splendid business making chipped glass number and name plates, signs, checkerboards. Write for particulars. Simple Utility Co., 1133 Broadway, New York.

LADIES earn \$3.00 to \$5.00 extra daily at home, for well known national advertiser. Artistic—refined—dignified. Experience unnecessary. We teach you—furnish everything. Fire-side Industries, Box 117-H, Adrian, Mich.

WANTED—Boys, Men. Do Auto repairing. \$25.00 week. Sample lessons free. Franklin Institute, Dept. T-100, Rochester, N. Y.

WOULD you risk a 1c postal against the chance to make \$5 to \$15 daily during the next four months with absolutely a new line of Insured Hostery, guaranteed 12 months. Your Pay Daily. Monthly bonus extra. Magnificent sample outfit furnished. If so, send name and address now to Macochee Textile Company, Card 2607, Cincinnati, Ohio.

FIREMEN, Brakemen, Baggage men (white or colored), sleeping car, train porters (colored). \$150-\$250 monthly. Experience unnecessary. 810 Railway Bureau, East St. Louis, Ill.

\$1,000 YEAR. Men, 18 up. Railway Postal Clerks. Sample coaching—free. Franklin Institute, Dept. T-10, Rochester, N. Y.

MEN, 18 up, wanting U. S. Mail Service positions, \$142 to \$225 monthly; steady; experience or correspondence course unnecessary; details free. Write P. Bradford, 112 N. 50th St., Philadelphia, Pa.

66 MILES on 1 Gallon.—Amazing new Gas Saver. All autos, 1 free. Critchlow, S-132, Wheaton, Ill.

\$1,000 YEAR. Men, 18 up. Railway Postal Clerks. Sample coaching—free. Write immediately. Franklin Institute, Dept. T-10, Rochester, N. Y.

A BUSINESS of Your Own Pays Best. Men and women are finding rich fields everywhere operating Ragsdale's Original "New System Specialty Candy Factories." Wholesale or retail, all or spare time. Under new plan we furnish everything and teach you fully. Few dollars establishes permanent, big paying business. Valuable Commercial Candy Book Free. W. Hillyer Ragsdale, Drawer 350, East Orange, N. J.

MEN—Women, 18 up. Get Government Jobs. \$95-\$250 month. Sample coaching free. Write immediately. Franklin Institute, Dept. T-10, Rochester, N. Y.

GET posted—good prices paid for butterflies, insects. See Sinclair display advertisement, page 26.

LOCOMOTIVE Firemen for railroads nearest their homes—everywhere: beginners \$150-\$250 monthly; promoted, locomotive engineer, \$3,000-\$4,000 yearly. Best paying positions on railroads. Railway Association, Desk M1, Brooklyn, N. Y.

WORK for "Uncle Sam." Postoffice Clerks—Carriers—Railway Postal Clerks, \$1,700-\$2,700 year. Men 18 up. Sample coaching free. Write immediately. Franklin Institute, Dept. T-10, Rochester, N. Y.

MANUSCRIPTS Wanted: Stories, Poems, Articles, Plays, etc. We help authors. Submit manuscripts to Writers' Society, 603 Hannibal, Mo.

MIRRORS Resilvered at Home. Costs less 5 cents per square foot; you charge 75 cents. Immense profits, plating auto-parts, reflectors, tableware, stores, refinishing metalware, etc. Outfits furnished. Write for information. Sprinkle, Plater, 77 Marion, Ind.

TRAIN in Los Angeles for Automotive and Electrical Trades. Big pay jobs ready when you complete short, practical training course in famous million dollar shops. Expert instructors. Free employment service. Board and room jobs. Reduced summer railroad and boat fares and tuition. Write for big free catalog quick. Say whether Auto or Electrical school. National Automotive & Electrical Schools, Dept. 93, 4004 So. Figueroa St., Los Angeles.

WANT a U. S. Government Job? \$1,140 to \$3,000 year. Become Railway Mail Clerks. (Travel—See your country.) Rural and City Mail Carriers, Post-Office Clerks, Clerks in Government offices. Paid vacations. Common education sufficient. Experience unnecessary. Full particulars and sample coaching—free. Write immediately. Franklin Institute, Dept. T-3, Rochester, N. Y.

MAKE money writing Photo-plays: details free to beginners. No correspondence course. Producer's League, 230 Wainwright, St. Louis.

DON'T prepare for any Civil Service Examination without seeing our catalogue, Free. Columbian Correspondence College, Washington, D. C.

EARN \$10 daily silvering mirrors, plating and refinishing metalware, auto, chandeliers, bedsteads, headboards. Outfits furnished. E. Docie Laboratories, 1133 Broadway, New York.

\$115—\$400 MONTHLY paid—By Station—offices positions. Free passes, experience unnecessary. Write Baker, Supt. (ABT) Star Bldg., St. Louis, Mo.

STEAMSHIP Positions—Europe, Orient. Good pay. Experience unnecessary. No compulsory service. Send stamped addressed envelope for list. Box 30-X, Mount Vernon, N. Y., or Box 331-A, Santa Monica, Calif.

SILVERING Mirrors, French plate. Easily learned; immense profits. Plans free. Address, Wear Mirror Works, Dept. 34, Escalier Springs, Mo.

INVENTORS desiring to secure patents should write for our book "How to Get Your Patent," tells our terms and methods. Send sketch for our examination and instructions without charge. Randolph & Co., Dept. 418, Washington, D. C.

ALL men-women, 18-60, wanting to qualify for Government Positions, \$140-\$225 monthly, local or traveling, write Mr. Ozenfant, 101, St. Louis, Mo. immediately.

U. S. GOVERNMENT wants men, \$1,700—\$1,900 and up at start. Railway Mail clerk examination coming. Let our expert (former Government examiner) prepare you for this and also Rural Carrier, Post Office, Customs, Internal Revenue, and other branches. Write today for free booklet, Dept. 8, Patterson Civil Service School, Rochester, N. Y.

INFORMATION

RELIABLE information on any one mechanical subject, \$2.00. Technical Research Bureau, Dept. A, 317 National Ave., Milwaukee, Wis.

ACCURATE specific information on any one subject \$5.00. National Information Bureau, 318A Shepard Building, Grand Rapids, Mich. Prompt service, satisfaction guaranteed.

BUSINESS SERVICE

ATTORNEYS and others wanting Mail address in Washington, D. C., Write Service, 517 Freges Bldg.

GUARANTEED—\$5 Money Getter Collection letters \$1.00. Commercial Bureau, Linwood Station, Detroit, Mich.

YOUNG MAN 24, requires engagements in England as representative, for genuine American firms. J. W. Haw, 30 Holme St., Beech St., Hull, Yorkshire, England.

CHARTERS—Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del. (99)

DELAWARE Incorporator, Charters; Fees small; forms. Chas. G. Guyer, 901 Orange St., Wilmington, Del.

BUSINESS Problems Solved—all kinds—buying, selling, financial, increasing business, advertising, getting men, getting positions, special formulas, processes, etc. Long business experience, thorough research, complete files of information. Complete solution of problem \$5, particulars free. Satisfaction guaranteed. All confidential. National Information Bureau, 318F Shepard Building, Grand Rapids, Mich.

TYPEWRITERS AND SUPPLIES

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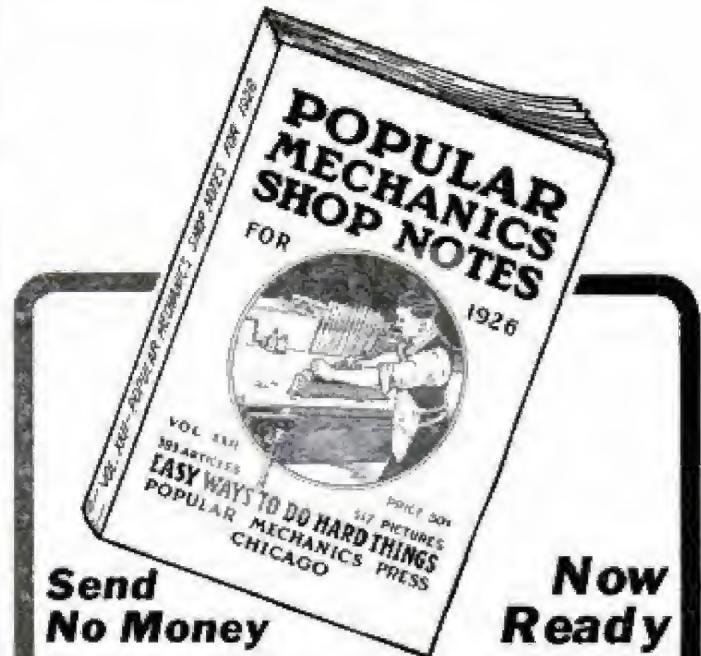
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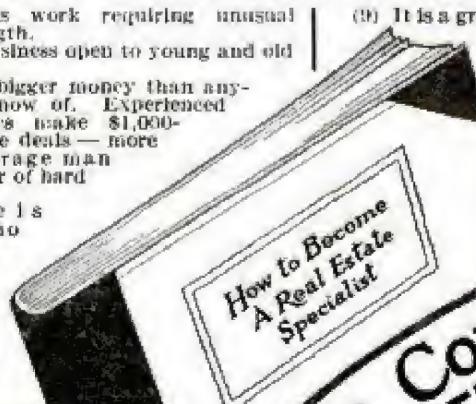
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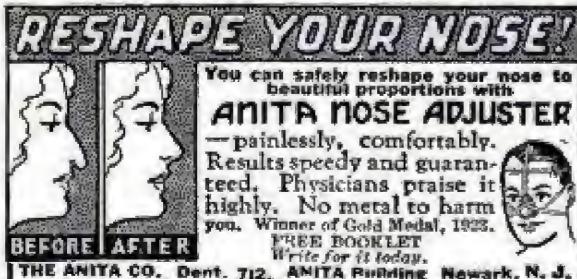
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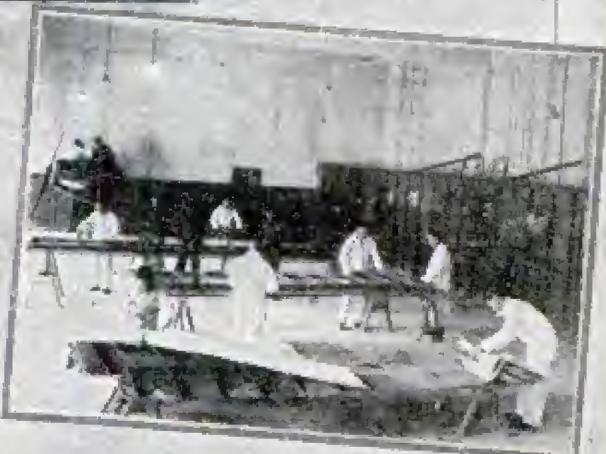
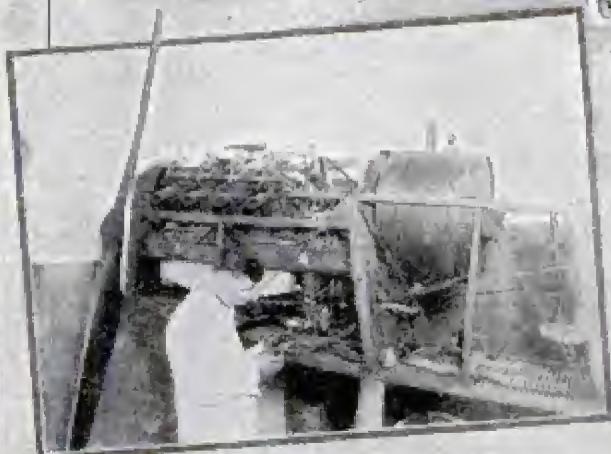
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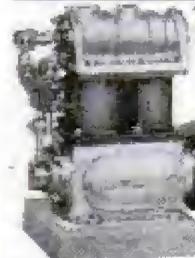
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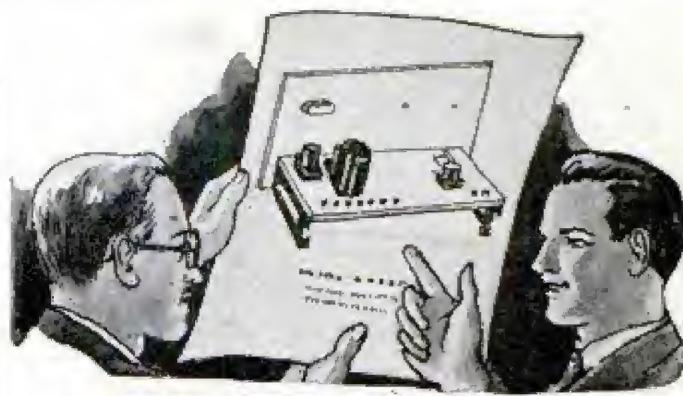
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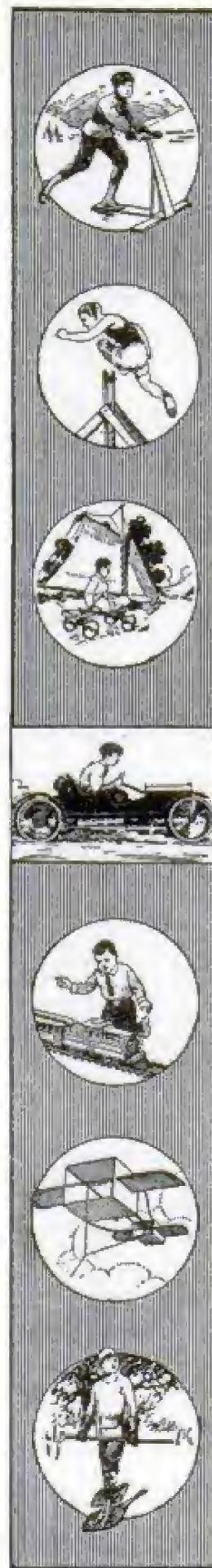
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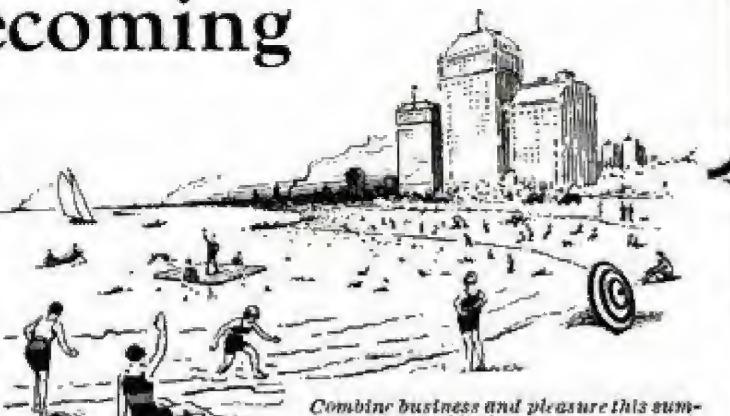
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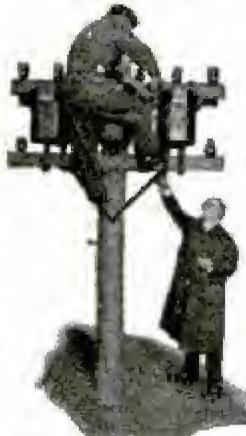
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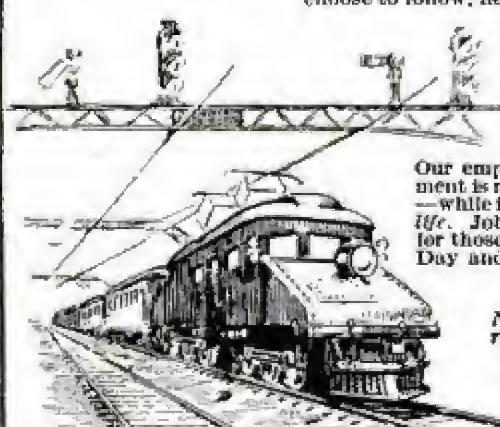
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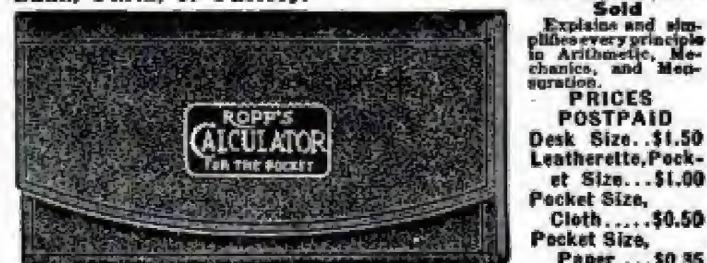
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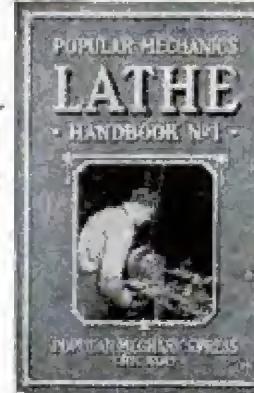
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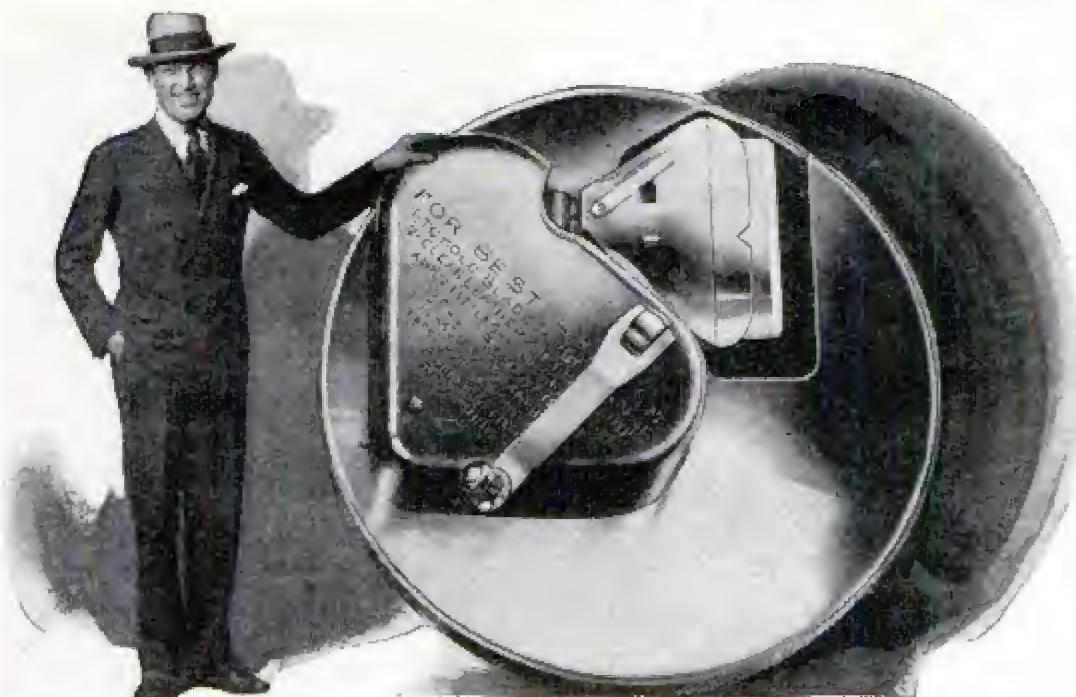
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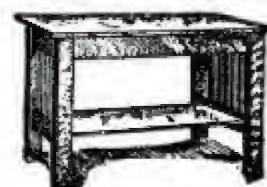
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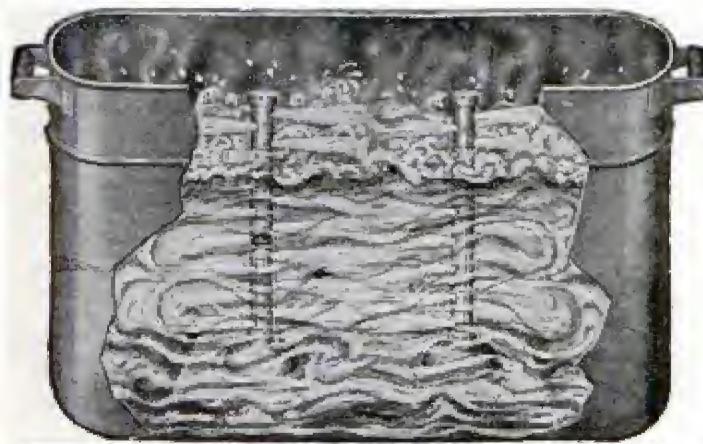
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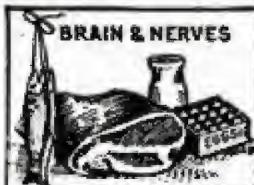
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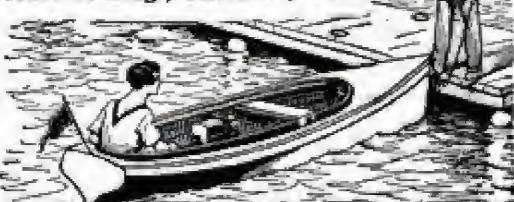
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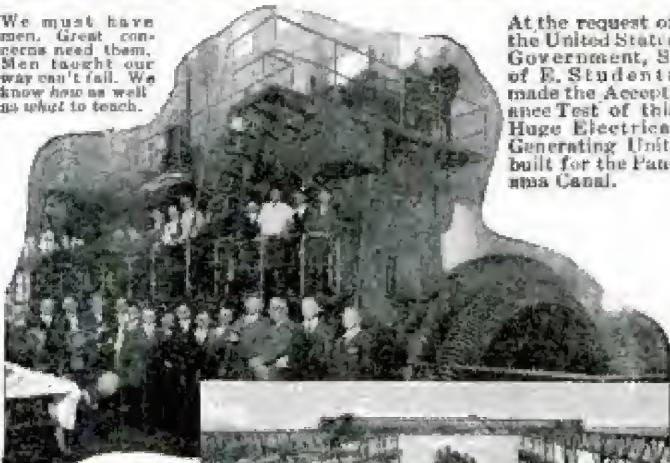
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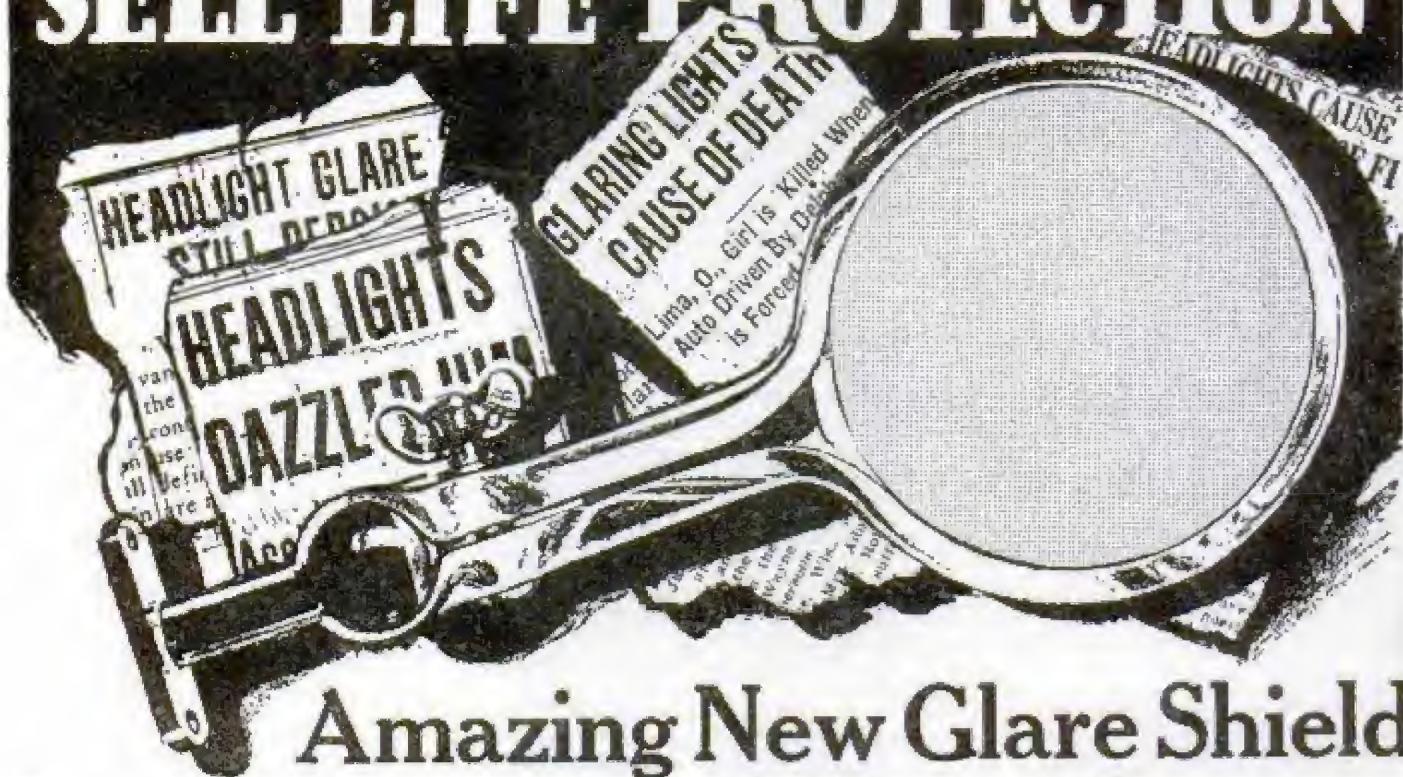
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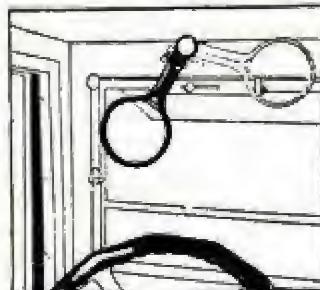


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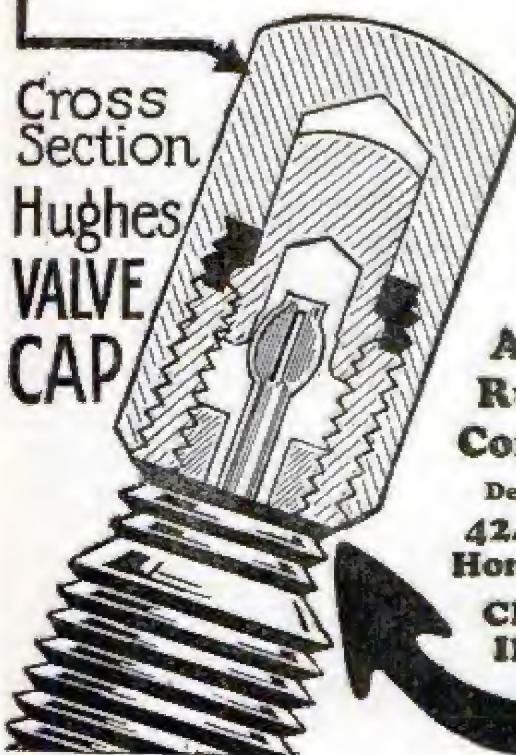
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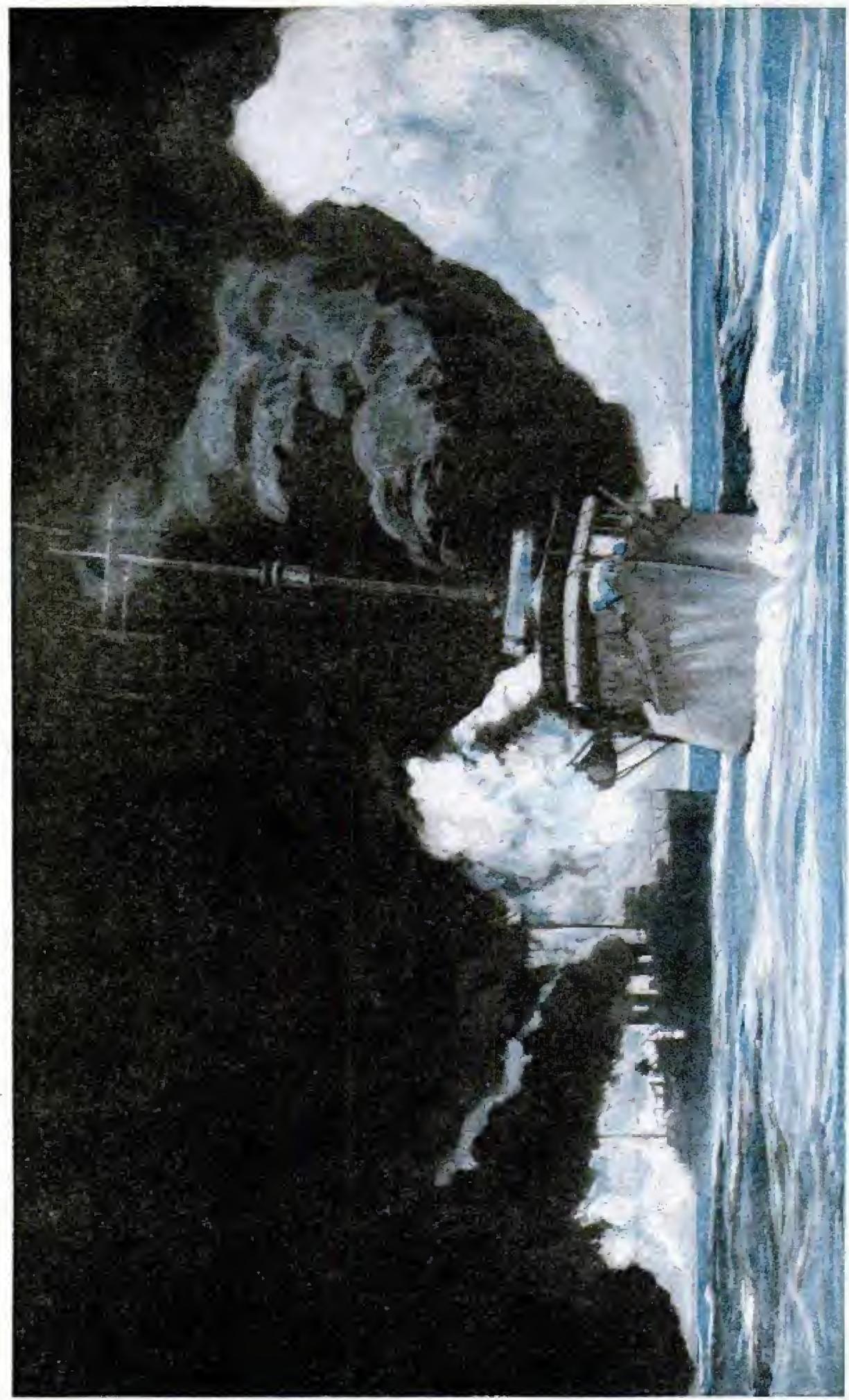
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Popular Mechanics Magazine

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Vol. 46

JULY, 1926

No. 1

Better Radio through the Earth

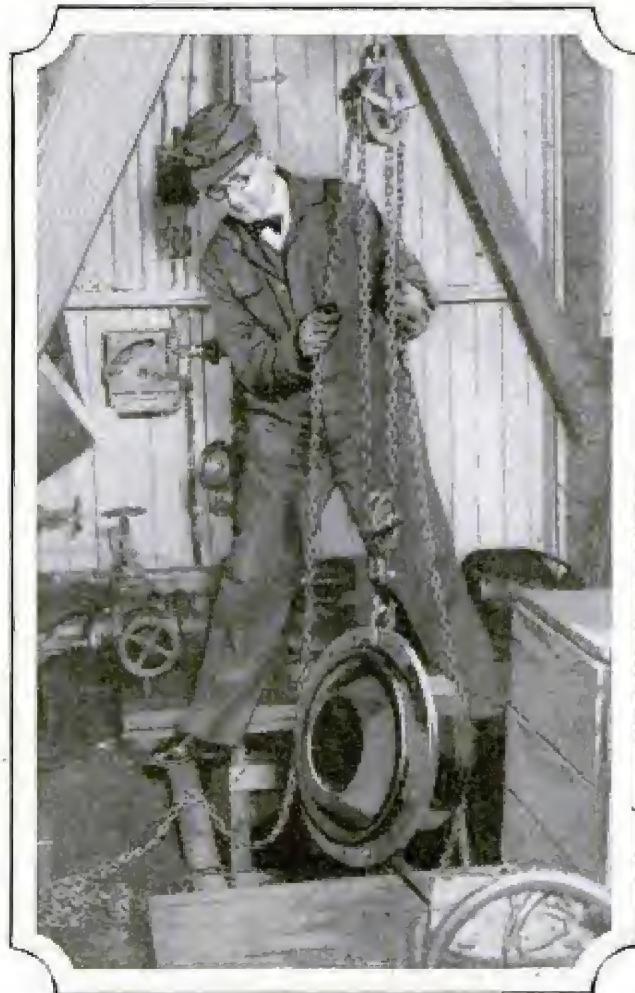
1851.

Buried Aerial Eliminates Trouble of Erecting Masts and Overhead Wires and Does Away with Some of the Static in the Air

THAT there are just as good radio waves traveling through the earth as can be picked out of the air, has been proved by experiments during the last two years, both with buried aerials and with receiving sets taken down into mines and tunnels. The radio fan with his aerial buried in the side yard likewise gets away from much of the static interference, due to electrical storms and other atmospheric disturbances.

Dr. J. Harris Rogers, inventor of under-ground and sub-sea systems of wireless

Dr. Rogers, who pioneered in the theory that radio waves traveled through the ground as well as in the air, also has a transmitting aerial which has sent out signals that have been picked up in Europe. It con-



Receiving Instrument for Underwater Wireless with
Which Conversations Have Been Carried On over a
Distance of Two Miles

which Conversations have been carried on over a
Distance of Two Miles
at Hyattsville, Md.



Left, J. Harris Rogers, Inventor of the Underground Aerial, and the Superheterodyne with Which It Was Used; Center, the Aerial in Its Water Pit, and Below, the Lead-In of a Buried Transmitting Antenna

sists of a fan-shaped series of wires laid underground in terra-cotta conduits.

"Once again," Dr. Rogers announced after the successful tests with the underground receiving aerial, "practical tests have demonstrated the validity of my theory that electromagnetic waves are propagated through the earth as well as through the air. I have never claimed that radio waves do not travel through the air, but I do insist that they are as readily propagated under ground and under water.

"Tests made of late with horizontal antennæ, notably those conducted by Dr. Greenleaf Pickard, further confirm the theory of earth propagation of radio waves. The signal intensities were much greater when the antenna was in a horizontal position than when it was erected perpendicularly. If energized by space waves, traveling through the air, the perpendicular position should be best, the electric forces being parallel to the earth's surface and their magnetic component, picked up by the antenna, perpendicular thereto."

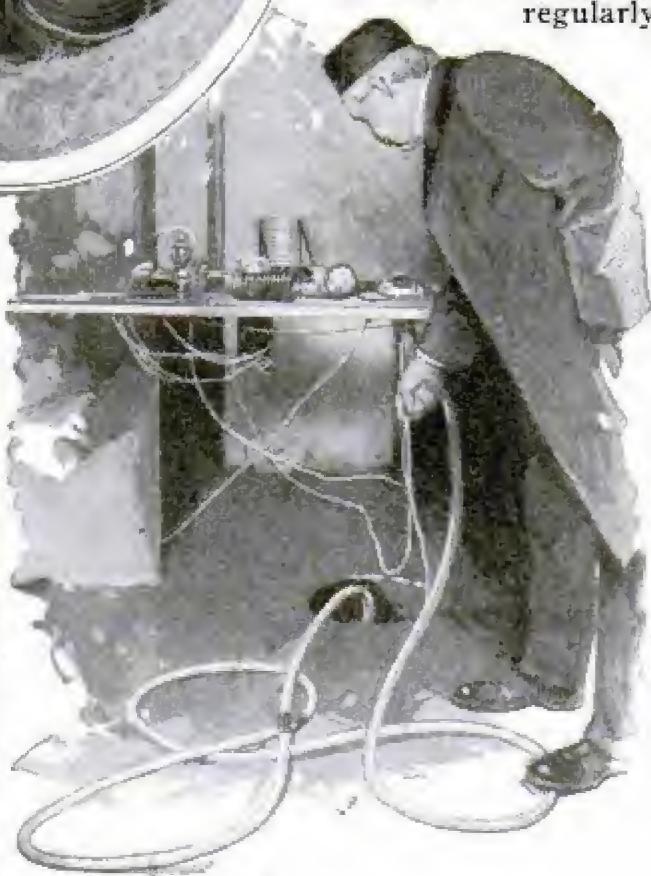
Buried aerials of several types have been

tried successfully. One, which has been on the market for some months, consists of a lead-sheathed copper wire, which is buried in a hole three feet deep, 100 feet of the cable being crowded into the hole by laying it in a spiral with a few inches of well tamped dirt between turns.

Dr. Rogers' experiments with the rod and copper disks were unusual in that, instead of the three-tap loop used ordinarily with superheterodyne receivers, only a single wire led to the set and one end of

the primary tuning coil was left unconnected. The set used, designed by Brent Daniel, formerly with the radio laboratory of the bureau of standards, was a seven-tube outfit, with a novel system of long extension rods for turning the condenser dials, in order to eliminate the capacity effect of the human body.

The use of superheterodynes for short-wave work, while comparatively unknown in this country, is quite common abroad. Such sets in London pick up the Pittsburgh rebroadcast regularly.



Ant. dra. endauer. 1927 7
Manif. 1929
on. Hollywood Calif.

1929



Rotating Balls in Rear Propel This Queer Craft, the Projecting Fins Acting like Paddles; to Steer, One Ball Is Stopped and the Rig Pivots Around like a Tractor

MOTORBOAT ON HOLLOW BALLS IS STEERED LIKE TRACTOR

Floating on three hollow balls, each four feet in diameter, and propelled by the revolutions of the two rear spheres, which are lined with fins, an odd craft was tested recently in Los Angeles harbor. The rotating balls were turned by a small automobile engine and to steer the boat, one of the balls was stopped while the other was allowed to turn, pivoting the craft about as a tractor is steered.

INDIAN BONES FOUND INCASED IN COPPER ARMOR 1946

Incased in armor of beaten-copper plates, the skeleton of what is believed to have been an Indian chief has been unearthed near Berea, Ky. The find is regarded as one of the most important of this nature ever made in that part of the country, and additional relics that may shed light on a little known chapter of Indian history are being sought by Prof. W. G. Burroughs, of Berea college, who found the skeleton. It was buried in one of the black shale "knobs," or blunt foothills, near the site of a prehistoric fort. The teeth were well preserved and worn flat, evidently due to eating dry corn and gritty material that sometimes fell into the Indians' food. Holes in the copper plates showed where thongs had been tied to hold the pieces together. Prof. Burroughs believes the armor to be thou-

sands of years old and that the copper originally came from the Lake Superior region. Its use was known to the Indians long before the white men came.

RADIO-PICTURE SERVICE OVER ATLANTIC IS STARTED 1943

Pilgrims made another journey to the United States from England a short time ago, but the trip consumed only minutes as compared with the historic voyage. A picture of the Pilgrims' society dinner, being held in London, was flashed by radio to a New York newspaper in one hour and forty-five minutes, inaugurating commercial wireless-picture service between the two countries. If static had not interfered with perfect transmission, the time taken would have been much less, as radio illustrations have been sent in only twenty minutes in earlier tests.

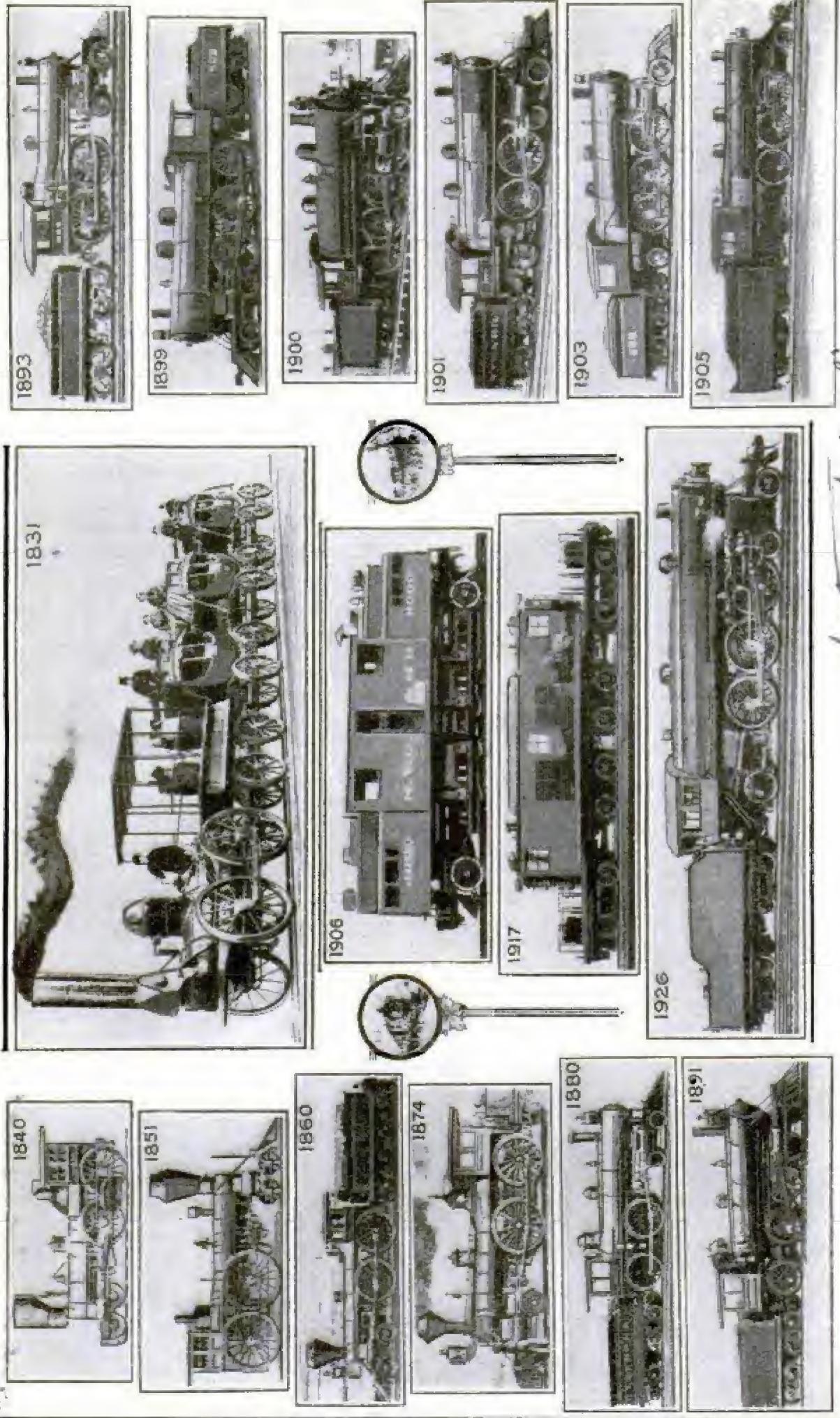


Radio Picture from Pilgrims' Society Dinner in London

Berea, Madison County
Ky.

Radio Corporation of America
233 Broadway, New York
Marconi Wireless Co. of England

1971



International

Important Steps in Locomotive Progress Since the Days When Stagecoaches on Rails Were Pulled by Rattling Wood Burners; Electric Power Necessitated Radical Changes in Engine Styles Which Have Passed through a Continual Evolution

Stoddard, Clubwoman of
Washington Heights⁵
New York

EVOLUTION OF LOCOMOTIVE IN CENTURY

Railroad transportation's "family album" revealed an interesting story of the evolution of the locomotive, during the recent celebration of the hundredth anniversary of the opening of the Mohawk and Hudson line, which was incorporated April 17, 1826. The principal changes in styles of engines were shown on a large chart, beginning with the time of the "DeWitt-Clinton," when trains were little more than stage-coaches on rails, down to the present with its immense steam engines and electric monsters that can pull strings of loaded cars two miles long up steep grades. Some authorities declare that modern civilization began with the invention of railroads and that the story of its progress is written more definitely in the development of the engine than in any other way.

1897

ALASKANS USE WINDOW CARDS TO ORDER DRINKING WATER

When residents of Fairbanks, Alaska, need drinking water, they hang a card in the window such as is used here for ice orders, the "water man" halts his conveyance, a wagon in summer and a sled in winter, and delivers the desired quantity. The supply is mainly derived from deep wells, and, in cold weather, a stove is placed near the tanks to keep the water from freezing. Most of the water for other purposes than drinking is obtained from a central plant and flows through underground pipes near steam conduits. In winter, the fire plugs are housed in tight boxes and heated by steam so that a water supply will be assured even on the coldest days when the mercury drops to sixty degrees or more below zero.

Cont. Linden B.

Penty % news monie,
a little Plaza

Gold Cup Portraying Old Indian King



Mrs. Mary H. Stoddard and Part of Her Collection of Sea Weeds Gathered along Vacation Beaches

GATHERING FLOWERS OF SEA WOMAN'S SUMMER HOBBY / 828.

Various kinds of sea weeds are gathered and mounted by a New York woman, who has found that the waters of some of the ocean beaches are little-known wonderlands filled with many interesting and beautiful forms of plant life. She has an extensive collection of the weeds.

PORTRAIT HAMMERED IN GOLD ON ANCIENT CUP / 872



Evidence of the splendor of the royal tables in Peru, before the days of Columbus, has been found in a cup of gold, ten inches high and bearing a portrait in hammered relief. It is believed to have belonged to the service of one of the Inca kings and is thought to antedate the time of the Spanish conquest by 1,000 years or more. Like other relics of the period, it shows the high degree of skill which these early Americans had attained in the art of gold beating. They also displayed exceptional skill as silversmiths, potters and engineers.

cont. Albert Beardeley, Residence, 2nd
Walcot Av. Residence, 2nd

Am. Mr. Nagel

6 Heidelberg POPULAR MECHANICS

Vanity Case Serves as
Grip for Handle and Is in
Convenient Position for
Use When Umbrella Is
Folded Up



VANITY CASE AND UMBRELLA COMBINED IN ONE

Folding into a compact bundle when not in use as a protector, an umbrella introduced in Germany contains a compartment for powder, rouge, lipstick and other things carried in the vanity case. The arrangement saves bothering with an extra article and is useful both on clear and stormy days.

1854

CHARIOT RACE BEHIND MOTORS THRILLS FESTIVAL CROWDS

Lurching behind roaring motorcycles, one-man chariots in a thrilling race furnished spectators at a London fair all the excitement of a contest among daring

riders plus the allurement of the speed duel made famous in Roman days. Team-work between the man on the cycle and the "driver" in the chariot was needed, especially on the curves when the two-wheeled vehicles skidded and bounced, and probably would have overturned but for the fact that the occupants leaned far to one side to maintain balance. Riders had to make allowance for their trailers as they shot past one another.

SEEK CURE FOR TUBERCULOSIS 1949 BY VACCINATION

Promise of immunity from tuberculosis by vaccination is seen in the results of experiments conducted by Prof. Albert Calmette, of the Pasteur institute, and of Dr. H. Selter, of the university of Koenigsberg. Since June, 1924, more than 4,500 children, all living in close proximity to the disease, have been vaccinated by Prof. Calmette with a weakened strain of microbe which had been cultivated for a number of years. Published records of 423 of the subjects showed that, in the first six months after vaccination, approximately one-third had been exposed but not one had died from tuberculosis, although thirty had died from other causes. Unvaccinated children of tuberculous parents and living under similar conditions, showed a mortality of twenty-four per cent in three years. Dr. Selter has experimented with virulent living microbes on the theory that inoculation with these would produce real immunity. He vaccinated nine children who were exposed to tuberculosis in their home surroundings with these virulent cultures. None of them suffered any ill effects.



Rounding a Curve during the Motorcycle Chariot Race; Occupants of the Trailers Leaned Far to One Side to Prevent Capsizing; Windshields Protected Them from Dust

Motorcycle chariot race

1972

2/24/26

7



Mysteries of the Sea

Book of Dead Ships ^{Wreck} Records Unexplained Tragedies Which Still Trap Vessels and Crews Despite Radio Protection

By J. EARLE MILLER

TWENTY-FIVE seamen, asleep in their berths, were wiped out almost instantly recently when an exploding cargo of high-test gasoline swept a column of fire through their tank ship, lying at a Texas gulf-port dock.

Had the accident happened at sea, another unexplained mystery would have been added to the thousands in the "Book of Dead Ships," for so swiftly did the fire spread that the sleeping sailors had no chance to even leave their bunks, and the officers in their cabins barely got away with their lives because of the near-by dock. At sea there would have been no time to launch a lifeboat or send a distress signal by radio.

The list of dead ships contains many that burned at sea, but, until the invention of the tanker, with its cargo of highly inflammable gasoline or oil, it seldom happened that a ship burned so fast the crew could not escape.

There are more than 300 ships lost every year, but, since the invention of radio, the toll that enters the book of unexplained mysteries has grown less and less. For a great modern steel steamer to be swallowed up by the sea so completely that not a life belt, a bit of shattered wood-

work, or any other marker floats away to tell the tale, seems impossible, but it continues to happen occasionally despite all the safeguards that can be placed around navigation.

The unexplained disappearance of the naval collier "Cyclops" during the war remains one of the most notable and amazing occurrences in all the history of the sea. A huge steel ship, big enough to carry 10,000 tons of cargo, manned by an efficient naval crew, equipped with a high-powered radio set, the latest thing in life-boats, scores of life preservers and other devices, the "Cyclops" apparently went down so suddenly that no call for help could be sent, no boats launched, life preservers thrown over the side, and so quickly and completely, it left no wreckage behind.

For more than seven years the disappearance puzzled the brains of navy chiefs, and then one day, a few months ago, a sister ship, of the same size and construction, did an amazing thing that cleared up, in most minds at least, the "Cyclops" loss. The sister ship, heavily loaded, as was the "Cyclops," with cargo disposed in the holds near either end, most easily reached by loading derricks, start-

ed bucking and bending in a fairly calm sea, but was rushed to port and saved. The experts decided the "Cyclops," lifted up amidships by a wave, broke her back, the break snapping the wireless aerial in half, and the two ends plunging to the bottom before any of the scores of crew and passengers had a chance to get away.

There are many such mysteries which may never be explained. The steamer "Orleanian," of 2,293 tons, sailed from New York for Malta on November 3, 1915, and was never heard from again. Her path led across the Atlantic, always a stormy place in winter, but one of the busiest trade routes in the world, with dozens of ships within radio call at any time. Yet the "Orleanian," put to sea with a crew of thirty-six, vanished utterly from the sea, and left not so much as a life buoy behind to tell of her loss.

In the underwriters' room at Lloyds, in London, the "Lutine's" bell tolled once

to proclaim another tragedy, the silent insurance men gathered round to hear the "Orleanian" announced as overdue, and she was entered in the "Book of Dead Ships."

In that same year the "Marowijne" sailed away from the coast of Yucatan, on August 13, on her thirteenth voyage. Date and number of the trip are carefully entered in the book of the lost, for sailor superstition cannot overlook such a combination as that. One day out, and the "Marowijne" was spoken by another ship. From that day to this, no one has ever seen her or any part of her. Ninety-six souls aboard, including twenty-eight passengers, went down with the ship.

Thousands of ships have been swallowed by the sea, but one of the strangest tales in all maritime records is that of the three ships that were swallowed by the land! All three disappeared in virtually the same spot, a graveyard of ships which now is well marked with warning buoys. The first was the tug "Taurus," engaged in aiding a stranded steamer off the jetty at the mouth of the Mississippi. The tug was straining at the tow-line, when a cross current whirled her around and she filled and sank. Another tug saved the steamer, but no trace of the tug was ever found. Quicksands had swallowed her complete.

Years later the oil tanker "Catonia," 330 feet long with 3,000 tons of crude oil from Tampico, punched a hole in her bottom on some hidden rock and was run aground in what appeared to be a safe spot in shallow water. The officers and crew went ashore to summon help to make repairs and refloat the vessel. They returned the next day in time to see the last of their ship disappearing into the ground. Soundings taken a few months later showed her far beneath the surface of the treacherous sands, sealed for all eternity. Next came the "Theodore



The Black-Robed Clerk in the Announcer's Pulpit at Lloyds, in London, Tolling the "Lutine" Bell to Announce Another Vessel Missing at Sea



Ashore on the Virginia Coast. This Danish Steamer Was Battered for Days by Heavy Seas, While the Coast Guards Stood By, Helpless to Aid Until the Storm Had Abated

Weems," steaming along in a fog, to crash head on into the "Heredia." The damaged "Weems" ran for shallow water, only to fall foul of the quicksands, sinking out of sight, but not before the crew had time to reach land.

Bits of wreckage, marked life preservers, messages in bottles, many things have helped clear up some of the mysteries of the sea, but the fate which takes a ship down without leaving any trace behind is still a puzzle. One of the most heroic chapters in the book of the dead ships is the story of the Japanese submarine "No. 6," lost in Hiroshima bay on April 18, 1910, with all on board, a crew of fourteen men. The ill-fated submarine will ever live in history because her commander, Lieut. Sakuma, used his last strength, as he lay dying in the steel death trap, to urge the navy not to lose confidence in submarines, and to apologize to his emperor for losing the ship.

In the library of congress in Washington there is a copy, in Japanese, of this famous letter, with a translation beside it, a unique case of the American government paying tribute to the heroism of a foreign naval officer.

"Words of apology fail me for having

sunk his majesty's submarine 'No. 6,'" Lieut. Sakuma began in the letter which was found with him when the submarine was raised a few days later. "My subordinates," he continued, "are killed by my fault, but it is with pride that I inform you that the crew to a man discharged their duties as sailors with the utmost coolness until their dying moments.

"We now sacrifice our lives for the sake of our country, but my fear is that the disaster will affect the future development of submarines. It is therefore my hope that nothing will daunt your determination to study the submarine until it is a perfect machine, absolutely reliable. We can then die without regret."

He then went on to describe the accident, how the sluice that admitted water for diving was wedged so it could not be closed, how the crew had tried to hold back the sea with their hands and failed, and how the rising water put out the electric generator and extinguished all the lights as they reached bottom.

"It was at 10:00 a.m., on the 18th inst., that the boat sank," he continued. "Surrounded by poisonous gas, the crew strove to pump out the water. The crew are now wet and it is extremely cold. It is my opinion that men embarking in submarines must possess the qualities of cool-

ness and nerve and must be extremely painstaking; they must be brave and daring in the handling of the boat. People may laugh at this opinion in view of my failure, but the statement is true.

"We have worked hard to pump out the water, but the boat is still in the same position. It is now twelve o'clock.

"The crew of a submarine should be selected from the bravest, the coolest, or they will be of little use in time of crises—in such as we are now. My brave men are doing their best."

He added a personal plea to the emperor that the families of the crew be provided for, told where to find his will, extended his respects to a long list of fellow officers, and then wrote:

"I thought I could blow out gasoline, but I am intoxicated with it—Capt. Makano—it is now 12:40 p.m."

On that unfinished sentence the letter ends. At ten o'clock in the morning they went to the bottom, and before one in the afternoon the pen fell from his fingers.

In the custom offices of busy ports, where the fate of the lost ships is preserved as part of the records, strange stories of the sea are hidden under the dry routine of official reports. The greatest tragedies—the ships that just disappear never to be heard from again—get the least mention, because there is so little to say beyond the brief "not since reported." But when the sea is foiled and gives up the men who become almost resigned to the inevitability of death, the case is dif-

ferent. Take the loss of the "Hildegard." a lumber barkentine, out of Brunswick, Ga., with a cargo for Havana, Cuba. On Dec. 17, 1916, in a raging gale, she got off her course and during the night ran afoul of a reef, whose usual marking of breaking waves was hidden by the towering seas. The ship was wedged fast and apparently doomed. Then tugs appeared out of the night and dragged her off.

The sea was cheated, but only for a time. Six months later, repaired and seaworthy, the barkentine had landed a cargo at Havre, France, and sailed away from there on July 7, 1917, for St. Thomas, in the Virgin islands. A few miles out from the coast, the lookout sighted the long streak left by a German periscope, and before he had time to shout a warning, the submarine broke the surface, a gun popped into view and the German commander megaphoned orders for the helpless sailing ship to stop.

A boat put off from the submarine and a boarding party placed bombs in the barkentine's hold, then returned to the submarine after ordering the crew of eight not to leave the doomed ship.

A few minutes later the "Hildegard" was torn from stem to stern by a terrific explosion, but at that moment, with almost equal suddenness, a wall of fog rolled down and hid the sinking ship from the gunners' crew on the submarine. Under this thick shroud, the crew launched a lifeboat and rowed toward the coast, being picked up later by an allied patrol.



But for Wireless the Loss of This Japanese Ship, 400 Miles off Boston, Would Have Been an Unsolved Mystery; the Radio Brought Aid Too Late, and the Entire Crew Was Lost

BURNING BIRDS
FOR TORCHES

The romance of artificial lighting has been traced back to the days when the early Shetland islanders fashioned a torch lamp by sticking a wick into the throat of a fat stormy petrel and to other crude beginnings by Dr. Walter Hough of the National museum. His researches reveal that animals have played an important part in furnishing light for man. In the tropics of America, natives once built cages for a species of large luminous beetles and used them as lanterns, while the Indians off the northwest coast of America burn a fat little fish for lighting purposes in much the same way as the Shetland islanders did the stormy petrel. Whales and seals have made the largest contribution in supplying lamp fuel. Up to 1859, when petroleum was discovered in large quantities, they furnished the major part of the world's lamp oil. An important step in the development of artificial lighting was the solution of the problem of draft for lamps. This is credited to a Swiss engineer named Argand in 1782. George Washington had some of the Argand lamps at Mount Vernon, and these are now included in the collections of the museum.



Test to Illustrate the Lifting Power of the Big Kites Included in Commander Byrd's Arctic Equipment

MAN-CARRYING KITES TO LIFT ARCTIC EXPLORERS

Kites so large that they will support a man have been included in the equipment carried by Lieut. Commander R. E. Byrd on his expedition to the Arctic. By means of a special steadyng device, the kites can be held sufficiently still for hoisting a radio aerial on them, or, should a survey be necessary, a man can be lifted by the kites, saving the use of an airplane.

1950.

CHECKERS IN SLOTTED BOARD STAY IN WHILE TRAVELING

Travelers who like to play checkers can do so with ease on a slotted board that holds the men in place and folds flat over them when the game is ended, or interrupted. The whole assembly is so small that it can be carried in the pocket and takes up but small space in the traveling bag.



Emile Kahn,

LIGHT STEEL FOR DWELLINGS WITHSTANDS HEAVY WINDS

Structural steel, light in weight but said to be stronger proportionally than any yet produced, is now being manufactured for dwellings. It can be used just as heavy beams are employed in skyscrapers, and is especially adapted to the construction of roofs and floors to afford resistance against winds, earthquakes and fires. Units are prepared in sizes and shapes suitable for rapid and easy construction.

Jones & Laughlin

12 Oaklawn Ave, Worcester, Mass.

CG

12 Oaklawn Ave, Worcester, Mass.



Tugboat with Party That Witnessed Demonstration, and End View Showing Arrangement of Hull and the Plate Chain

CATERPILLAR TANK AS TUGBOAT RUNS IN SHALLOW WATER

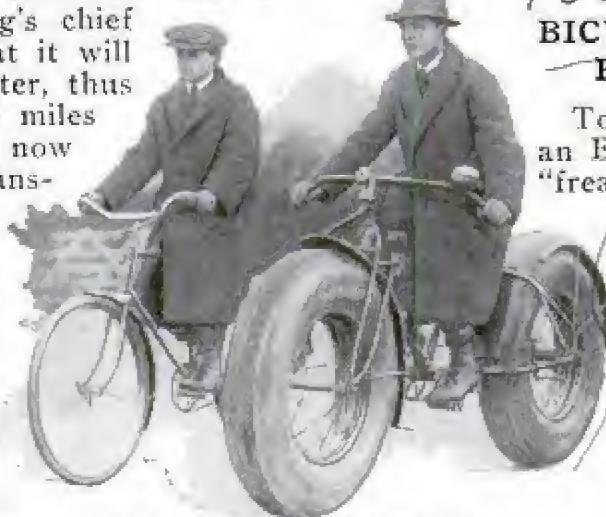
Extensive development of inland water transportation is promised from a new type of tugboat for river barges. Its outstanding feature is the method of propulsion. Instead of wheels or propellers, a chain of perforated cups runs under the hull at a point where the keel would be. It is like the caterpillar drive of war tanks and tractors. The tug's chief claim to service is that it will operate in shallow water, thus utilizing thousands of miles of inland streams now unsuitable for transportation purposes. Interesting tests with one of these boats were held recently on the Mississippi river. An empty barge was pushed and pulled in rapidly changing directions. A large wave from a passing steamer sunk the

intermediate river-freight service over the more than 25,000 navigable streams in the United States. The development will begin with the fourteen major rivers of the Mississippi river valley, it was announced. Barges would be of a standard width of sixteen feet and up to 100 feet long. The smallest, fifty feet in length, are designed to hold a load equivalent to that carried by a railroad freight car.

1659

BICYCLE ADVERTISES BALLOON TIRES

To advertise its product, an English firm equipped a "freak" bicycle with balloon tires. Their size was accentuated by having an ordinary bicycle ridden beside the special. Although the large tires required more propelling power, they proved to be very efficient shock absorbers.



Balloon-Tired Bicycle for Display

at Leicester, Eng.

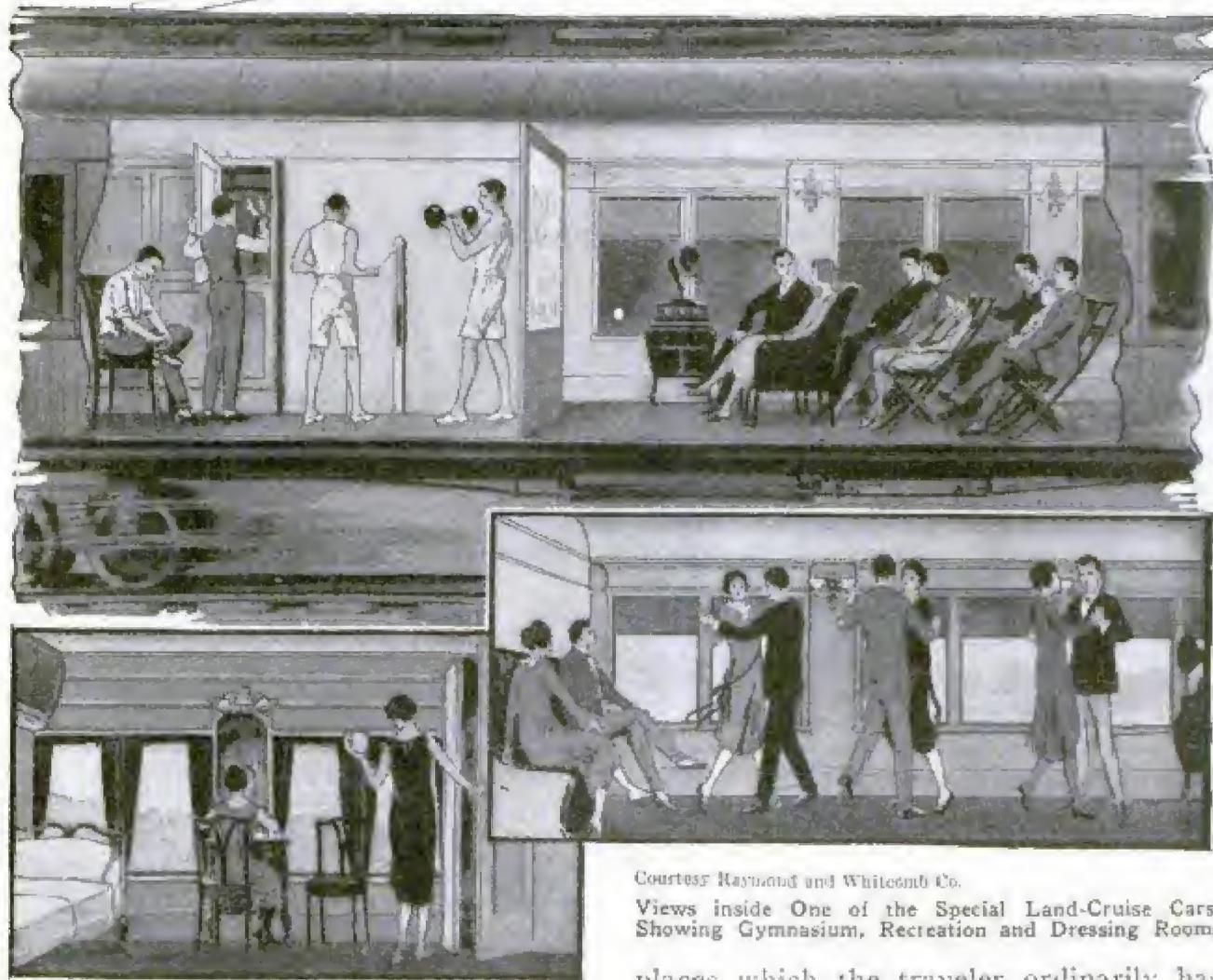
barge but in three minutes, the tug had pulled it up at such an angle that it was emptied of water and, in another ten minutes, was tied at its wharf. At first glance, the boat resembles a floating greenhouse. The shelter deck is inclosed by glass. Inside is a curved hump, the housing for the caterpillar. Below this, the hull is like that of other river craft except that the two ends have the same shape. Power is now supplied from a gasoline motor, but this is to be supplanted by a Diesel-electric engine, burning crude oil. The tug used in the test was thirty feet long, twelve feet wide and developed fifty horsepower, displaced only eighteen inches of water and was said to be efficient at a depth of only three feet. Larger tugs are contemplated up to 1,000 horsepower, with a view to extending a type of through and in-

1926

POPULAR MECHANICS

165 Tremont St.
Boston, Mass
92 E. Jackson Blvd. Chicago

LAND CRUISES TO PROVIDE OCEAN LINER LUXURIES



Courtesy Raymond and Whitecomb Co.

Views inside One of the Special Land-Cruise Cars.
Showing Gymnasium, Recreation and Dressing Rooms

There is a new kind of travel called a land cruise. It is the last word in luxurious railway journeying. By its complete contrast to the old days it brings to mind the early stages of American railroading. Forty years ago, to travel from New York to California meant an arduous trip in badly lighted cars, without a diner, with only cold water to wash with—and that requiring pumping by hand. The land cruise of today is a voyage in specially built and luxurious cars affording every comfort of the modern ocean liner. The train consists of nine all-steel cars; a recreation car with gymnasium, locker room, shower bath, entertainment and dance hall (seating forty-nine persons), a motion-picture machine, a radio receiving set, a barber shop and a library lounge; an observation car with a spacious platform; a specially constructed sleeping car, containing real beds and private baths; other cars with drawing rooms, compartments and improved Pullman sections with permanent partitions; as well as a dining and baggage car. The cruise train, in trips of from two to six weeks, will visit

places which the traveler ordinarily has to omit or to reach at the cost of days of waiting for connections and of great discomfort. Trips are planned to cover the northwest, the central Rockies, the southwest, California, the Canadian Rockies and Alaska.

GLASS MADE WITHOUT SAND
FROM MYSTERY METAL 1934

Chemists at Cornell university have discovered a way of making sandless glass by using a compound of germanium, a rare newly discovered metal, as a substitute for the usual silica. The process indicates a possible practical application of the metal, which scientists hitherto have found no use for. It is a flaky crystalline substance, hard and extremely brittle, and is worth many dollars a gram. The metal is extracted from zinc oxide and scientists are studying its compounds in the belief that the element has medicinal properties that may be helpful to mankind. It is now being produced in relatively large quantities at Cornell, about a gram of it being obtained from a pound of raw material.

Prof. L. M. Dennis
Cornell University



Boiling Lava

Forty-Six Acres of Molten Lava Rising Up from the Pit of Hawaii's Great Volcano, with a Fire Fountain in Action on the Right; Note the Curious, Irregular Lava Streams

He Lives on the Edge of a Volcano

Prof. Jaggar Risks Life in Hawaii to Study Eruptions in the Hope That He May Be Able to Predict Them

IT is probable that the recent spectacular eruption of the volcano Mauna Loa, which rocked the largest of the Hawaiian islands, is of far greater significance than is supposed, because of the fact that the phenomenon was observed by men who have devoted their lives to the study of volcanoes.

These men, headed by the foremost authority on volcanoes in the world, Prof. T. A. Jaggar, were in the unique position of being fully equipped and on the ground before the eruption began.

To the layman the appeal of the latest outburst on the picturesque side of this peak, 13,675 feet high, lies in the gigantic fountains of lava, estimated to be 150 to 200 feet high, which leaped from the newly formed crater, and the terrific river of molten lava which flowed, slowly at first and then swiftly, down to the sea, enveloping and consuming everything in its path. The sight was one of the most awe-inspiring in years.

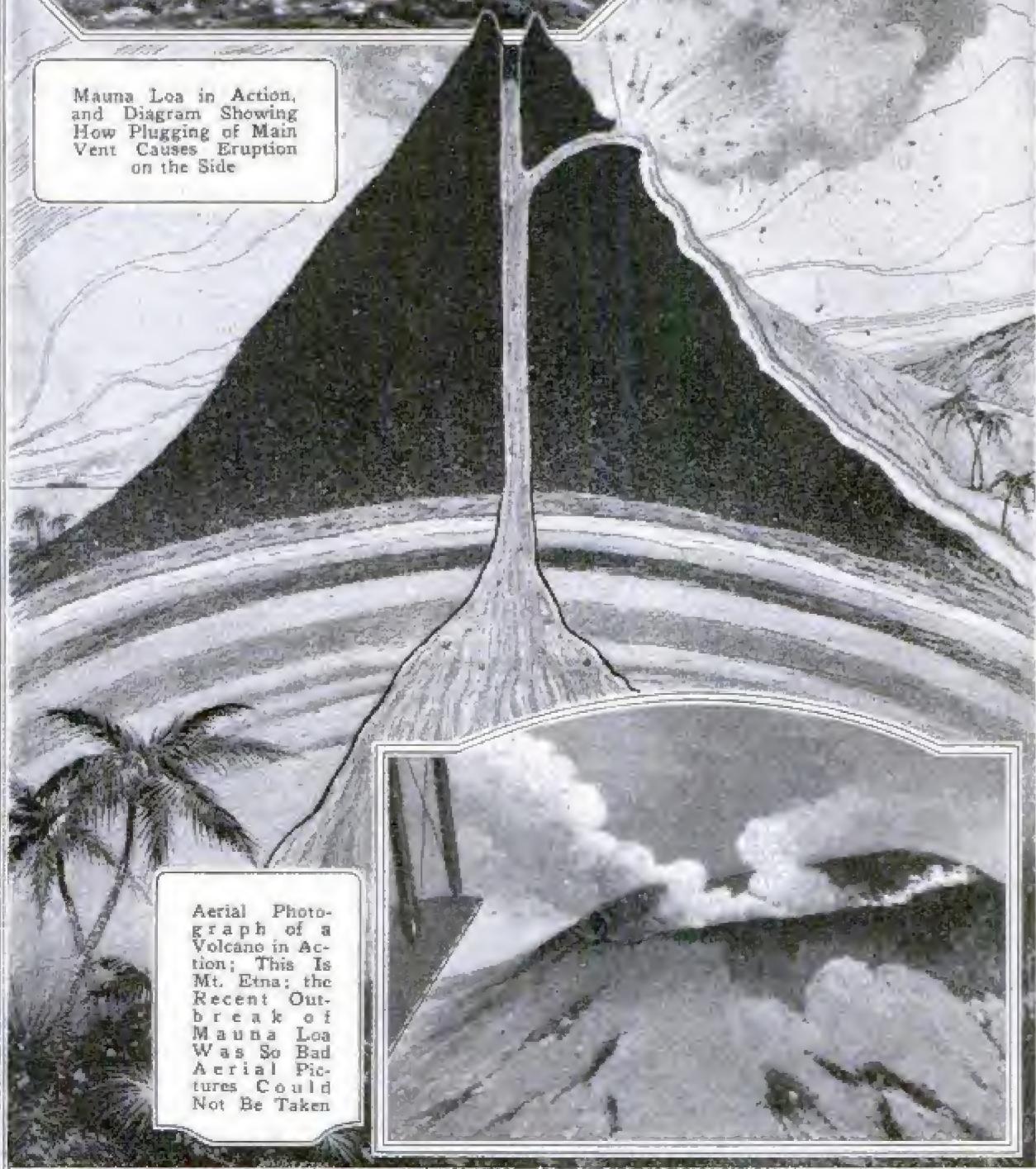
The first eruption was not at the summit of the mountain, but at a point about

12,000 feet above sea level. After several hours of quiet, following the initial out-break, additional lava flows appeared at five or six points in the mountain side. These outbursts finally converged into two main streams which began moving slowly down the slope. The initial motion of this fiery flood was slow owing to the fact that contact with the earth cooled the lava and retarded it. After the "track" had been laid, in some cases 1,800 feet wide, the speed increased from a few rods an hour to two or more miles.

Aviators flew over the devastated region while the lava progressed, and reported that the heat was so intense they had to keep at an elevation of 3,000 feet. Prof. Jaggar was among the most venturesome of the observers, making observations at points which involved much personal danger. The scientist's insatiable desire for first-hand information recalls his earlier work of drilling holes in the lava to determine the temperatures below. He had a well rig and a steam engine and was doing the job in regular well-driller fashion. At



Mauna Loa in Action,
and Diagram Showing
How Plugging of Main
Vent Causes Eruption
on the Side



Aerial Photo-
graph of a
Volcano in Ac-
tion; This Is
Mt. Etna; the
Recent Out-
break of
Mauna Loa
Was So Bad
Aerial Pic-
tures Could
Not Be Taken



that time he was hoping to find means of harnessing the heat of the volcano for commercial purposes, as has been done in Italy. He still cherishes that hope.

Among Prof. Jaggar's other objectives in studying a great eruption are determination of the composition of the gases that are given off; the temperatures of the lava; the frequency and violence of the earthquakes (which sometimes total hundreds daily); the extent of the earth tilts and fluctuations of lava.

While all of these things mean little to the layman, they are of the utmost importance to the scientist who has given more than twenty years of his life, fourteen on this island, to a first-hand study of volcanoes. Previous to settling down on the brink of Kilauea, he made numerous expeditions to volcanoes, after their eruption had started. While these investigations yielded some valuable information, it was as nothing compared with data he has been able to acquire while living year in and year out near the edge of a live crater.

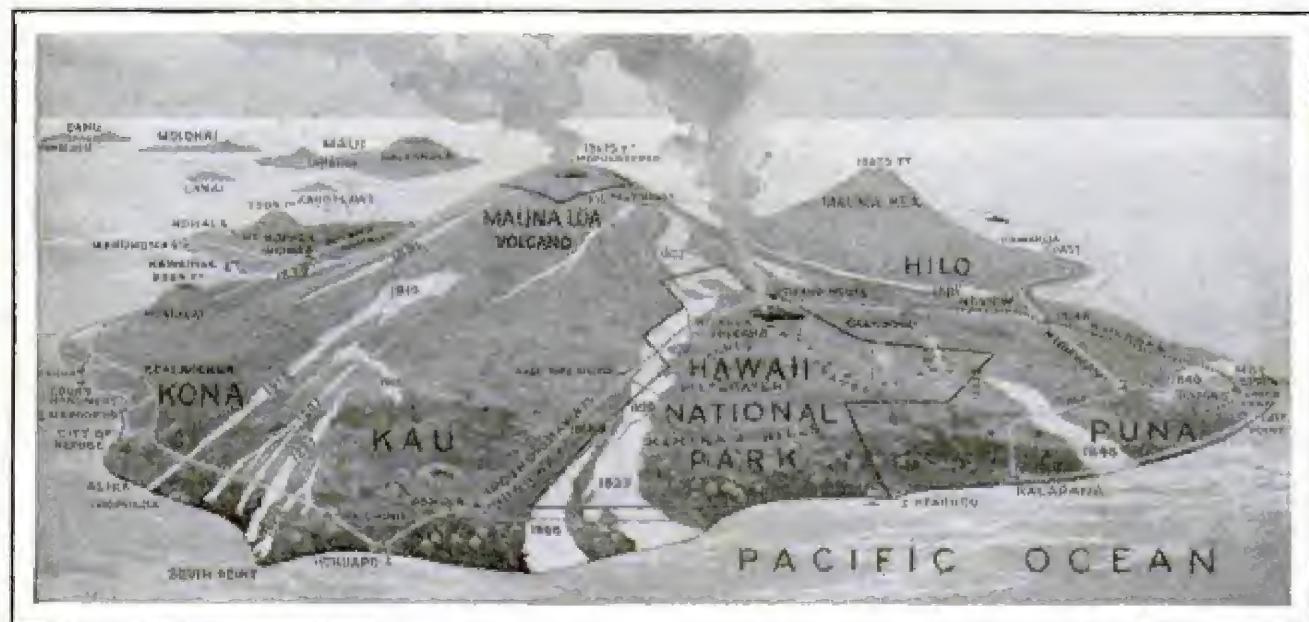
As a result of his studies, Prof. Jaggar has definitely established the fact that eruptions in the two Hawaiian volcanoes—and presumably in all or most other volcanoes—occur in more or less definite cycles. In some cases the periods between eruptions may be a few months in length, while in other cases it may be a few years or even a century. The riddle he hopes to solve is, "How accurately can these eruptions be predicted," and why is the cycle of nine years which Mauna Loa, for example, maintained since 1823, now being badly broken up. The last eruption of this volcano was in 1924. Prof.

Jaggar believes that there never is an "effect" without a cause. In other words no volcano ever blows up without preceding events taking place in definite sequence. He has proved further that if we will use instruments sufficiently delicate and if we are patient enough in their use, we can definitely record these "preceding events."

A volcano blowing off as Mauna Loa has been doing of late is nothing more or less than a gigantic tea kettle boiling over, the professor seeks to explain in non-technical language. But the simile is only superficially correct because there are so many other forces and factors at work. The nature of the gases, the pressures they are under, the amount of water if any that contributes this increasing pressure, the gradual shrinking and consequent cracking of the "teapot"—these are some of the many factors that complicate the situation but do not baffle the scientists.

There is a good deal of ground for the belief held by many who have studied Mauna Loa's actions at short range, that the great volcano has entered a new era in its age-long history. The recent repeated petulant eruptions may be interpreted either as the approach of a senile old age—if such a term may be applied to a volcano—or the preparation for a gigantic upheaval the like of which has never taken place in the whole 150 years of Mauna Loa's recorded history.

It would seem that Prof. Jaggar does not incline to the latter belief for he and Mrs. Jaggar have their home on the very brink of fiery Kilauea and times without number earthquakes have shaken the house foundations until their dwelling rocked and careened on its base.



Bird's-Eye View of America's Two Most Active Volcanoes; Mauna Loa, on the Left, Was the Scene of the Latest Disturbance; Kilauea, on the Right, Is Called "The House of Everlasting Fire"

3/15/26

Used at Madgehole Farm 16°

POPULAR MECHANICS

SALVAGING BURNT MONEY 163

It was the morning before Christmas, but the man who appeared at the treasury department in Washington was the picture of dejection. He carried two tin boxes filled with cinders of \$1,000 in bills, laid away to pay off a mortgage. His house had burned down, destroying everything he had. But the government salvage experts set to work, and that afternoon paid him a large portion of the sum in crisp new bills, all that they had been able to identify from the ashes. This is a sample of the service performed by this interesting department of the treasury. The salvagers daily receive from 100 to 200

packages, ranging from envelopes and tin cans to large wooden boxes filled with cinders of hard, charred lumps, which they must examine closely for possible identification as currency. Little bits of engraving or serial numbers often give clues to the bills. The fragments are pasted on thin sheets of tissue paper to reproduce the original bill as closely as possible, and a record is kept of its number and payment so that the same bill will not be redeemed twice. Affidavits accompanying the burned money must also be checked and verified. Sometimes nothing but fine ashes is sent in and the experts can make nothing of them. One man raked up all the ashes in his furnace and shipped them in a huge box. He thought that the government could identify the money by chemical analysis but that was impossible. Another declared that he had sent in the ashes of \$600, but only \$100 could be identified, and that amount was paid.



Clay-Pigeon Gun in Operation on Shooting Grounds; Hunters Get Practice Where Real Game Is Often Found

NEW CLAY-PIGEON THROWER DEVELOPS HUNTER'S AIM

Practice in shooting at clay targets can now be conducted under typical hunting conditions with the aid of a special kind of thrower introduced in England. It is of portable size so that it can be easily carried to places where real birds are found in season and the gunner can employ the same tactics as he would in approaching live game.

1540.

ANCIENT OSTRICH EGG MENDED BY EXPERT

What the old story-book legend declares "all the king's horses and all the king's men" could not do by way of repairing "Humpty Dumpty," has been accomplished by an expert of the Field museum of natural history in assembling the fragments of an ostrich egg believed to be some 6,000 years old. It was found in the ancient ruins of Kish.



T. Ito of the Field Museum Staff Drinking from Ostrich-Egg Cup He Put Together

Acme Manufacturers 461 8th Ave. New York

Owned by Mrs. A. V. *Plano, d. ll.*

18

POPULAR MECHANICS

1908



One of the Giants of the Chicago Dog Show, "Cuno Krebs," a Great Dane Weighing 176 Pounds

DOG EIGHT HANDS HIGH WEIGHS AS MUCH AS MAN

"Cuno Krebs," a Great Dane exhibited at a recent dog show in Chicago, is thirty-three and one-half inches high at the shoulders and weighs 176 pounds, typical of the best specimens of the breed which is similar in some respects to the German boarhound. The Great Danes sometimes attain a height of more than three feet and weigh nearly 200 pounds.

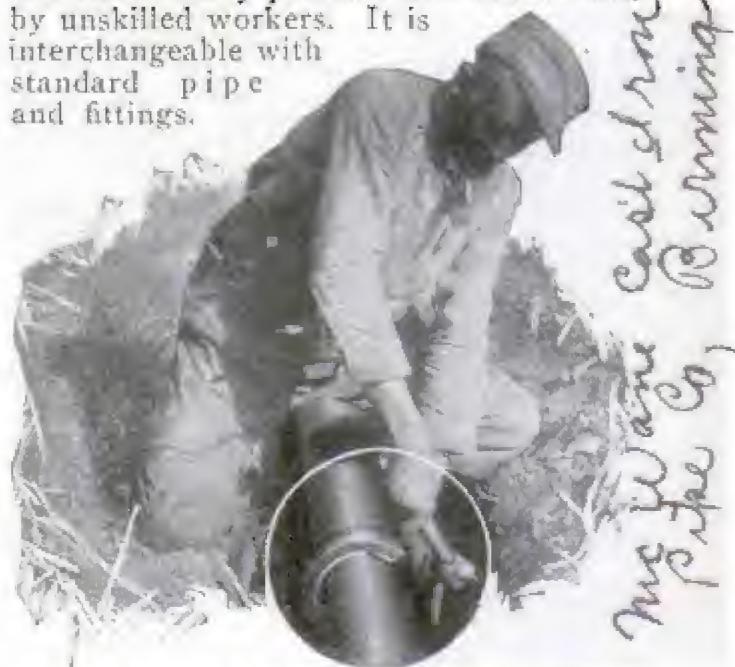
SUNKEN SHIPS SEALED BY ICE TO AID IN SALVAGE

In salvage operations, attempts are often made to float sunken vessels by sealing them tightly, pumping out the water and thus raising them to the surface. The sealing is frequently a difficult matter, and to aid in this step, a German inventor has devised a submarine refrigeration plant by which a vessel can be coated with a sheet of ice over the damaged part so that the hole is plugged and the pumps can force out the water. Cables lower the plant to the scene of the operations and cooling liquids are forced down through pipe lines from above. The pipes are placed over the aperture in such a way that, in the case of a metal ship, the hull is cooled at the same time and the ice ad-

heres firmly to the plates. In case the damage consists of a holed bottom, and is inaccessible, a quantity of highly cooled oil is introduced into the vessel, causing a coating of ice to form below the oil layer, thus sealing the ship. It is asserted that this process, by cooling the vessel's hull and causing contraction, helps to loosen it from the silt and mud of the sea floor. Sunken ships are a constant menace to navigators and fishermen, and they also frequently cause breaks in cable lines. The British admiralty recently published a set of charts, showing by red dots, the approximate positions of sunken ships. The coast lines appeared to have been spattered with a brush full of red ink, so numerous were the wrecks.

READY-CALKED PIPE SAVES TIME

Lead, jute and a self-tightening arrangement are inserted in pipe of the familiar bell-and-spigot type at the foundry, saving such work in the trench. This is said to permit laying the pipe about three times as fast as is possible with ordinary kinds, and at a saving of approximately one-half the labor. The spigot end has two rings of indentations so placed that the joint materials are forced into them by calking, and they render a blow-out almost impossible. Tests have shown that this style of pipe will resist heavy pressure and can be laid by unskilled workers. It is interchangeable with standard pipe and fittings.



Finishing Calking the Joint before Laying the Pipe; Several Lengths Can Be Put in Trench at a Time

W. Kenwell

Oil & Gas Co., Birmingham, Ala.



Blazing Trails for the Map Makers

Geodetic Survey's Reconnaissance Engineers Scout Country Preparing Preliminary Surveys under Unusual Hardships

By DONALD EDWARD KEYHOE

*Reconnaissance
Engineer, Coast and
Geodetic Survey.*

JUST off a northern Missouri road, in a lonely spot, half hidden by the driving snow of a heavy blizzard, stood a small tent, curiously out of place in such bleak surroundings. Beside the tent, and driven as close as possible to break the bitter wind, rested a mud-spattered truck, its contents carefully covered with a tarpaulin. But for the stormy night there might have been passers-by to wonder at this strange camp, but the few who came that way hurried on unseeing, their minds on the cozy firesides awaiting them at home. The unusual license tag on the truck might have solved the riddle for some, but there would have been many to whom the word "geodetic" would only have served to increase the mystery.

Few people realize the discomforts which frequently are experienced by the reconnaissance engineers of the coast and geodetic survey in the field work which takes them over all parts of the United States. When the closing hour comes for the average business man, he is free to go home, to mingle with his friends and to amuse himself in a dozen ways. When

the failing light of day renders further observations impossible for the geodetic engineer, his work is only partly finished. He must select a stopping place, pitch his tent, and prepare for a lonely night, with only his thoughts for company.

Living in this manner is not unpleasant in fair weather, but the surveyor who camps out in the winter months is not to be envied. The Missouri camp scene just described is no flight of fancy, but is a true picture of conditions recently encountered by J. S. Bilby, of the coast and geodetic survey. The blizzard which set in one night just after he had made his camp would have caused most people to emulate or even surpass the Arabs in rolling up their tents and stealing away. Yet by an ingenious expedient Mr. Bilby made himself quite comfortable, according to his own statement.

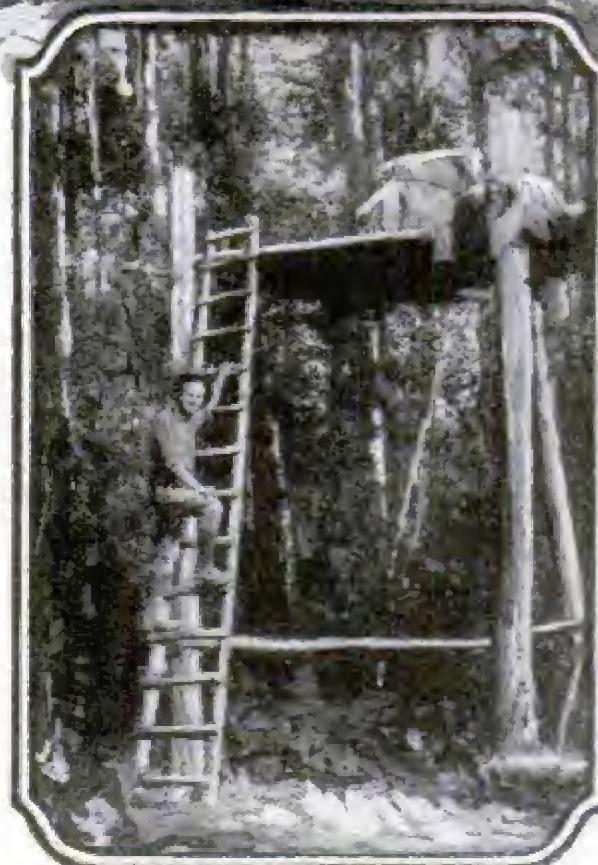
"The wind was blowing a gale," reads his report, "and it became so cold that my two-burner gasoline stove would not heat my tent. I took an ordinary five-gallon motor-oil can and filled it nearly full of water. Leaving off the cap, I placed the



Shore Camp in the Everglades Built on Stilts as Protection against Alligators and Other Crawling Things

can on the stove and waited until the water began boiling, when I turned down the blaze so that the temperature hung just under the mark. Then I spread a tarpaulin over my cot so that it came down to the floor on all sides. By putting a lighted lantern underneath I managed to keep my bed warm, while my hot-water system warmed the tent. It was fine. If the weather gets any colder, I'll just add another can of water."

The reconnaissance engineer who works alone like this, marking triangulation stations ahead of the main surveying party, must be proficient in several matters, in



Food Cache of Survey Party in the Northwest, Elevated on a Platform as Protection against Animals

addition to having the technical knowledge required of him. He must be an automobile mechanic; he must be able to pitch and break camp in a few minutes, under the most trying conditions of weather; he must cook well enough to satisfy his own tastes, and he must be a man who has initiative and decision in emergencies, for he is almost entirely "on his own" in this work.

At best, such a life becomes lonely at times. Mr. Bilby, who has had years of experience in geodetic work, admits this.

"Especially," he adds, "when the wind is howling through the trees, and the rain is pattering down on the tent, and you

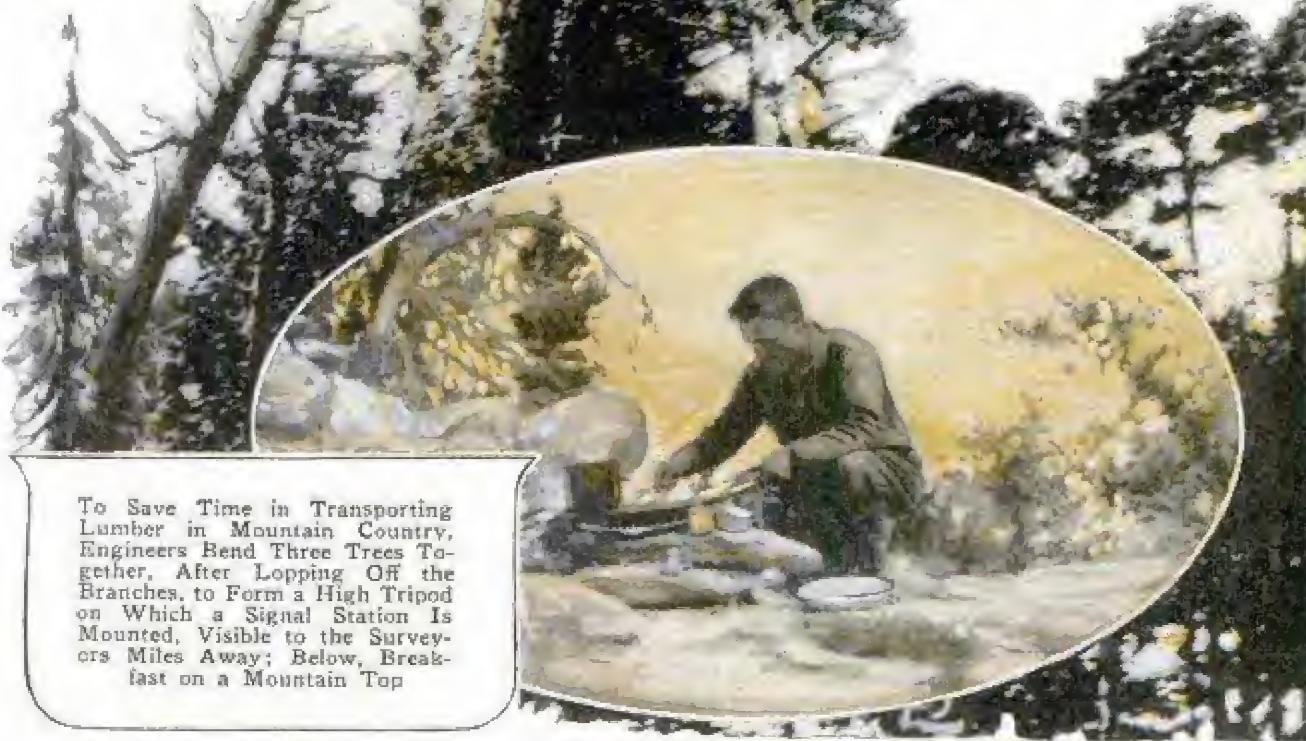
know there's little chance of anyone dropping by. But the radio has made a big difference for me. Now my aerial pole goes up just as soon as I pitch my tent, and after I've cooked supper I hook up the set and tune in a concert somewhere. Speaking of radio, I've had some odd things happen in the more outlying parts of the country.

"One evening I had stopped at a desolate spot in Montana and had rigged up my set so I could get in touch with civilization. While I was listening to an orchestra, I heard a noise near the tent and looked up to see a small boy staring at me. I hadn't an idea where he came from, but there he was. He asked me what I was doing. Rather surprised, I told him I was listening on the radio.

"'Radio?' he repeated. 'What's that?'

"When I saw that he wasn't joking, I explained the apparatus briefly and handed him the earphones. He listened with eyes popping out and a scared look on his face.

"'Where's this a'comin' from?' he demanded, pulling off the headset.



To Save Time in Transporting Lumber in Mountain Country, Engineers Bend Three Trees Together, After Lopping Off the Branches, to Form a High Tripod on Which a Signal Station Is Mounted, Visible to the Surveyors Miles Away; Below, Breakfast on a Mountain Top

"I told him it was Kansas City, but I saw the name didn't mean anything to him, so I explained it was a large place several hundreds of miles south, in the state of Missouri. That was as far as I got. He backed away and was out of the door before I could say another word. I thought perhaps he was half-witted, and I didn't expect to see him again, but in about an hour a wagon drove up. There was the boy, with his father and mother and the rest of the family, which was over half a dozen children. The boy had run all the way home—wherever that was—to tell them about the music that came out of the air, and they hadn't wasted any time in getting back to see if he was telling the truth. Incredible as it seems, none of them had ever heard of such a thing as the radio. That shows how far out in the 'wilds' we get some times. I tuned in stations all over the country for them, and they never left until the last one signed off.

"Another time, down in Mississippi, I had a funny experience. I struck camp late one afternoon, by chance picking a lot near a negro

church about half a mile from a small town. There were two plantation boys watching me as I put up my tent and antenna, but I didn't pay much attention to them. After supper I was listening to a program while I got ready to make out my daily reports, when I heard a commotion in the lot outside. I glanced out and saw some hundred and fifty negroes drive into the lot with old buggies and wagons, but I supposed they were going on into

sets and passed them around. It wasn't long before that Virginny reel music had an effect. In a few minutes the phones were handed on, but the first listeners began making their own music, and they had some mighty good voices, too. That started the whole crowd going, and in a little while they were singing and dancing away, with the radio half forgotten. There was a show all right, but they put it on themselves. It lasted until after midnight.



Lacking a Dog Team, the Surveying Party in Alaska Furnishes Its Own Motive Power to Drag the Instruments and Supplies over a Snow-Capped Plateau Far from Civilization

the church so I went back to my reports. In a little while one of them put his head in at the door.

"We all waiting fo' de show to begin," he announced.

"Then it dawned on me. The two boys who had been watching me put up my tent had mistaken me for one of those old-time medicine men who draw crowds by a little act or two before trying to sell their patent medicines, tonics or pills. They had evidently spread the word far and wide, for the crowd was getting bigger all the time. I didn't want to disappoint them, for they were good-natured, easy-going plantation folk, so I did the best I could. I happened to know that it was 'Old Fiddlers' Night' at Jefferson City, so I tuned in and moved the set out to the door. Then I split the two head-

"Radio has made the coast and geodetic survey known more than it used to be. A few years ago people were always asking what the name meant, but now I often find they know us pretty well, from talks they've heard on the air. One lecture on mountain building which was broadcast from Washington was the means of getting me a fine dinner. I had stopped at a farmhouse to make inquiries and the farmer noticed my 'geodetic' tag. He mentioned this talk he'd heard, and when I said it must have been given by the chief of my division, Major Bowie, he became so interested that he made me stay to dinner to answer his questions. However, that wasn't unwelcome after eating my own cooking for so long."

An extract from one of Mr. Bilby's old reports reading, "lost half a day on ac-



A Barrel Wagon, Used as a Sled Substitute, Has Wheels Made by Sticking Rods through the Barrel Centers

count of a storm," gives an interesting sidelight on this typical engineer, when it is explained that the storm was later found to be a true-to-form Kansas tornado, which scooped up his tent and blew it clear into the next county.

The work of the survey in mapping Alaska and fixing the boundaries has taken the engineers over winter trails in the far north,



Surveyors in the Tropics Are molested by Bee Swarms, Making a Net Necessary to Protect the Face; Below, the Northernmost Point on the Line Dividing Alaska and Canada

down unknown rivers, and into land where, probably, no white man had penetrated before. They have met the Canadian surveyors on the shores of the Arctic ocean east of Point Barrow, the northernmost spot under the American flag, and there placed the Stars and Stripes beside that of the Canadian survey.



1755

24

Chevy Chase,
Washington, D. C.

POPULAR MECHANICS



Electric Cabinet Adjusted over Sleeper, and End View Showing Switch and Arrangement of Lights Inside; Black Shield Protects the Eyes from Direct Light

LIGHT BATH WHILE SLEEPING KEEP'S INVENTOR WELL

A "sun bath" every night while sleeping in his electric-light bed, keeps the inventor, a Washington man, in vigorous health, free from colds and pulmonary troubles, he declares. His body is exposed directly to the beneficial rays, the bulbs being arranged so that even distribution is effected, and the glow is concentrated by means of reflectors around the bed, while the eyes are shielded from direct light.

KEY TO MARS MYSTERY IS SOUGHT THIS FALL

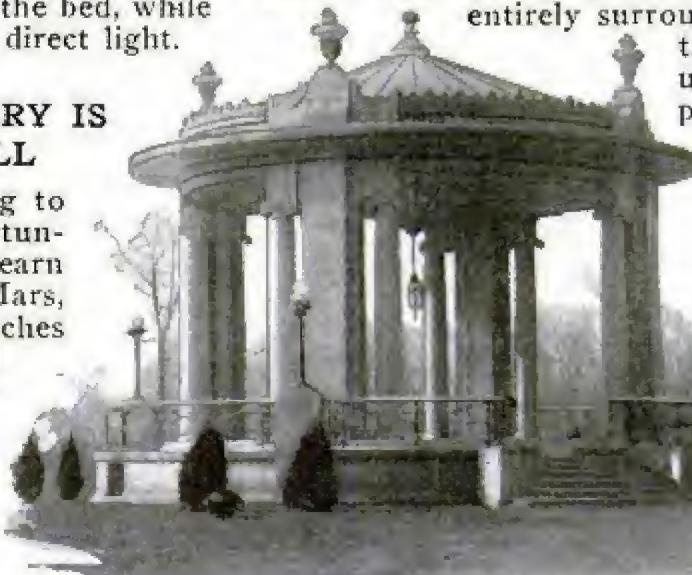
Astronomers are planning to make the best of the opportunity late this summer to learn more of the mysteries of Mars, when the planet approaches nearer the earth than it will in another fifty years. Special studies are to be made at Lowell observatory at Flagstaff, Ariz., where, by means of delicate instruments, Dr. W. W. Coblenz of the bureau of standards determined that the Martian temperatures

range from far below zero to the balmy weather of spring. Further information concerning these temperatures, and not so much the question as to whether or not there is life on Mars, will be the chief objective of the study. If man does exist on the planet, scientists believe that he is specially equipped to survive under the rapid changes of temperature there. In six hours, extremes from freezing to halfway to the boiling point of water are believed to be the lot of the Martians, if there are such creatures. They possibly have wings for quick locomotion or their feet are shovel-shaped so that they can dig into earth for protection during cold spells. If there is vegetation, it is supposed to be like the mosses or lichens that thrive in cold weather on the earth.

COPPER BANDSTAND ROOF IMPROVES TONE

Constructed of limestone and copper, an outdoor memorial bandstand, erected in a St. Louis park at a cost of \$50,000, has been planned for the best musical effects as well as for ornament. It stands on a concrete foundation and the roof and ceiling, which are of copper, are intended to give added resonance to the tones of the instruments without impairing their quality or muffling them. The floor is of a composition material and the pillars and railings of stone. The stand is placed on a mound

entirely surrounded by water to afford unobstructed passage for the music.

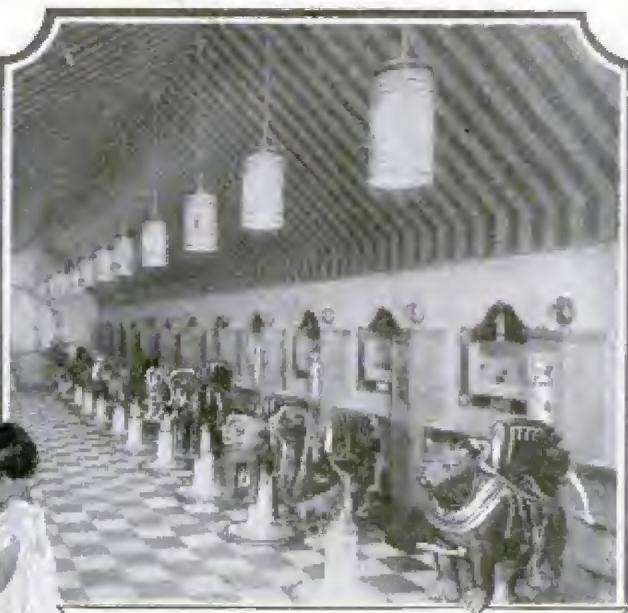


New Bandstand in St. Louis Park; Constructed of Copper and Stone, It Is Intended to Insure Successful Concerts

Kansas City Star

Gift of Nathan C. and
John C. Greenman

CHILDREN'S BARBER SHOP IS FITTED UP LIKE CIRCUS



Looking at the Peep Show While Waiting: Interior of the Shop and Patrons



Having their hair cut holds little terror for children taken to a shop in a mid-western city. It has been fitted up as a sort of playroom with chairs resembling animals of various kinds, and twelve little cabinet theaters on the opposite side of the room, one across from each chair, so that the occupant will have something interesting to watch while the barber is at work. While waiting their turn, the children can enjoy a peep show in the outer room of the shop as well as animal pictures on the walls. Keeping them outside the hair-cutting room until they are to be waited upon also prevents the fear that sometimes arises from watching other children having their hair cut. Shades on the ceiling lights, hangings, upholstery and other features of the shop carry out the idea of a circus tent.

1638

BUZZARD WITH BELL ON NECK SHOT IN GEORGIA

For years a belled buzzard has been reported from time to time in such widely different parts of the country that most persons had come to regard it as a myth. But evidently the tales were well founded

for recently a farmer, while hunting near Comer, Ga., brought down a huge buzzard which had a small cowbell tied to its neck by a piece of wire that had nearly rusted in two. On the bell was this inscription, crudely carved but plainly legible: "Joel Mine, Leonville—1882." There is a town of that name in Louisiana, but it has not yet been definitely established that the buzzard was first caught and tagged there. Considering the rapidity with which these birds fly and their long lives, it is thought possible that the buzzard originally may have come from some more distant place and has probably been flying with the bell about its neck for forty-four years.

D. C. Beachmore

1806
26
Protectorate Co., 15 & Ogden Ave.
Jersey City, N.J.



Taking Temperature of the Coal Pile

HEAT GAUGE FOR COAL PILES REDUCES FIRE HAZARD

Costly fires sometimes occur when piles of coal becomes ignited from spontaneous combustion. To reduce the danger from this source, a special thermometer equipment has been devised. It has three dials for telling the temperature at different depths. The instrument is inserted in the coal by means of a rod extension.

LOUD SPEAKER IN COURTROOM AIDS JURY SELECTION

Enabling the judge to hear responses to questions propounded to prospective jurors in a New York courtroom, a loud



Adapting Radio Principles to Aid Justice; Loud-Speaker System in Courtroom Amplifies Voices of Jury Panel under Questioning

speaker and microphone proved effective against outside noises. The speaker was placed near the ceiling in the center and the microphone on the judge's bench.

REBUILDING OF OLD IRONSIDES RECALLS DEEP MYSTERY

Plans for the restoration of the historic "Constitution" recall many absorbing tales about the famous frigate and have reopened a perplexing mystery—what became of the original Andrew Jackson figurehead that pointed "Old Ironsides" about the seas for forty years? The Jackson figurehead now at the naval academy at Annapolis is said not to be the original which was mutilated in Boston in 1834, for it represents Jackson with the left hand thrust into his coat at the breast. An old engraving showing the "Constitution" moored between the "Columbus" and the "Independence" in Boston harbor, shows that Jackson carried his hat in the left hand. No record can be found as to when the original decoration, the fourth to be attached to the ship, was removed and replaced with a different model. But a certain test awaits the first of the two figures if it ever is found. Inspired by a wave of political antagonism that suddenly had arisen against Jackson and as a "daredevil" adventure, Charles Dewey, a young man from Boston, during a rain and wind-storm on the night of July 2, 1834, sawed off a part of the head. He later delivered the fragment to the secretary of the navy and told President Jackson what he had done. Jackson was more amused than angered, declaring that the figure never had been a good likeness from the first. The position of the cut, historians declare,

will establish the authenticity of any figurehead produced as the original. Secretary Wilbur has asked that students of naval history and others assist by supplying any authentic information possible concerning the ship's ornament. The first one attached was an effigy of Hercules, completed with the vessel in 1797. This was knocked off or damaged beyond repair during the war with the Tripoli pirates. It has been suggested that this be adopted as the figurehead for the restored "Constitution."

514 Woodward Bldg
Washington, D. C.

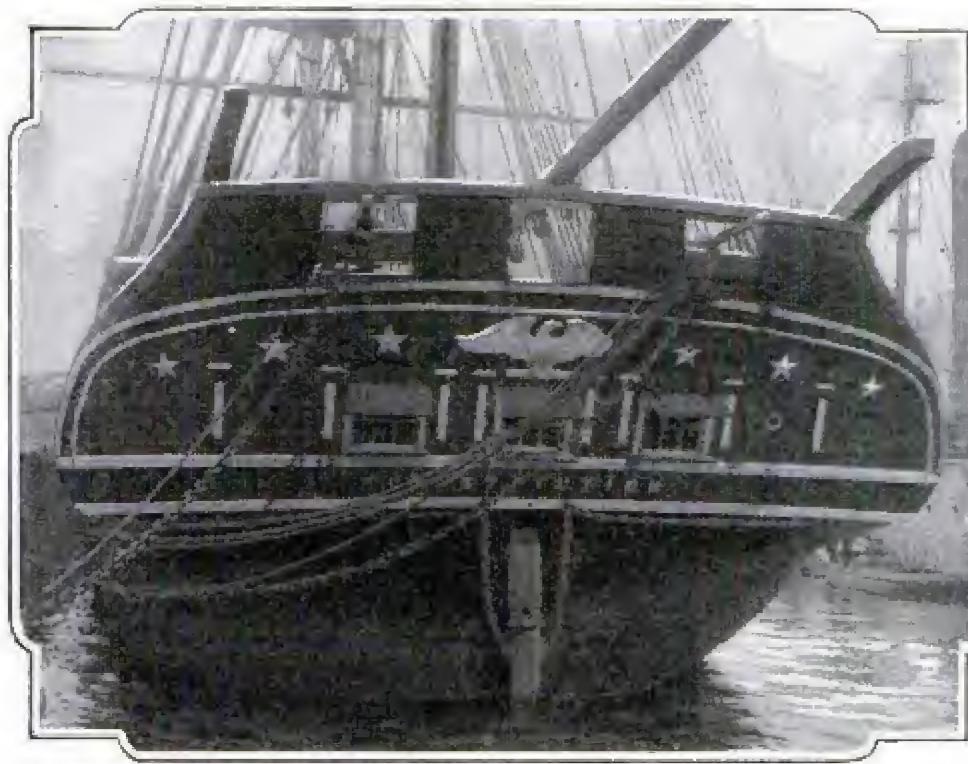
A REMINDER OF AMERICAN VICTORIES AT SEA



From a Print, Published in 1835, Showing Jackson Figurehead with Hat in Hand on the "Constitution"



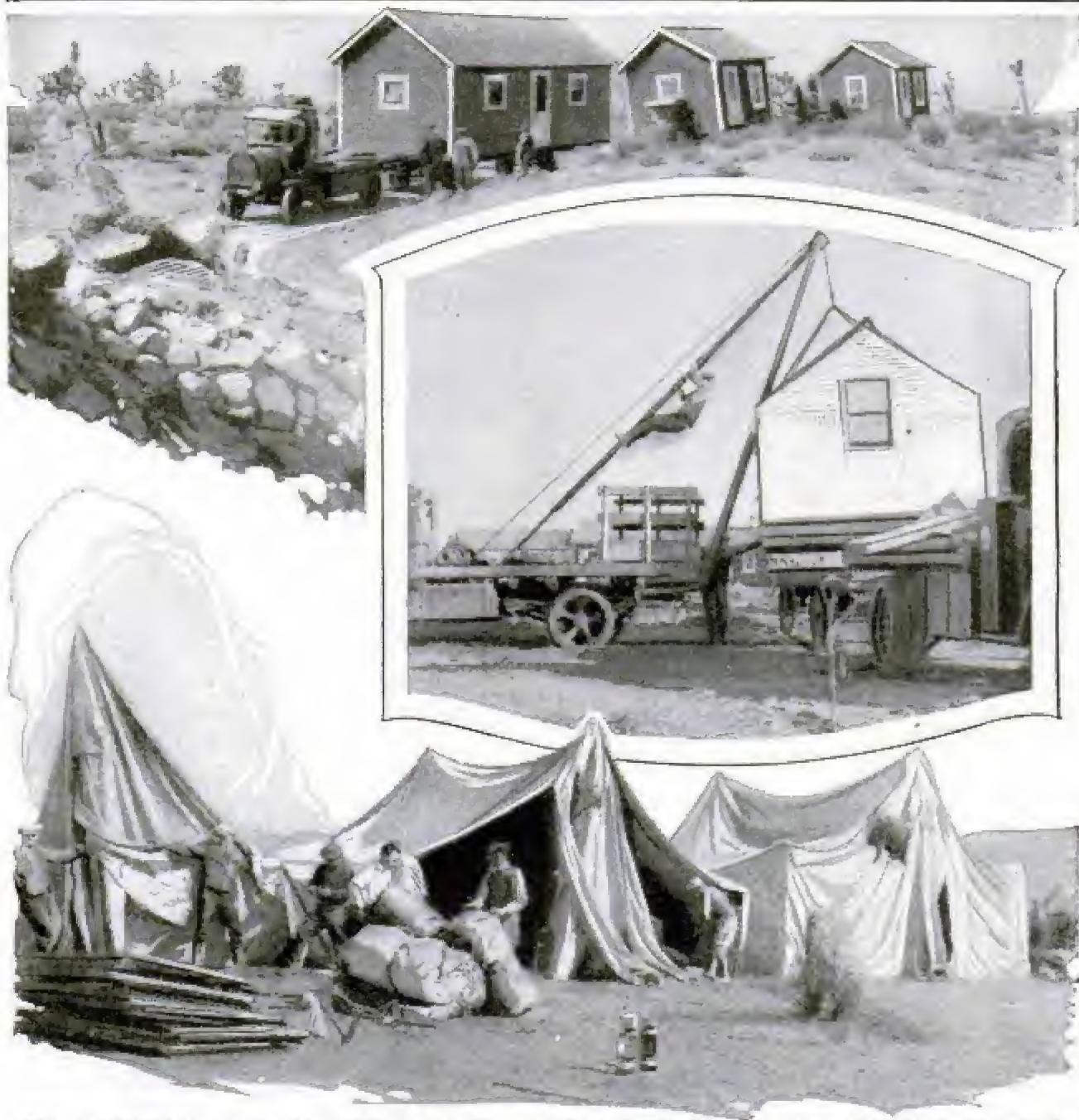
What Is Claimed to Be the Original Jackson Figurehead; the One at Annapolis Depicts Jackson with Left Hand Thrust in Coat; at the Right, the Billet Head of the "Constitution" as Ship Appears Moored at Boston before Restoration.



Above Is What Was Long Supposed to Be the Billet Head Carried by the "Constitution" during the War of 1812; It Is Now at the Naval Academy, but Did Not Belong to "Old Ironsides"; at the Left, the Historic Ship in Harbor Awaiting Rebuilding

1818

DESERT CITY IS MOVED BY TRUCKS IN SINGLE DAY



When a City Takes to the Road; Moving the Town of Lone Wolf, Calif., Fourteen Miles by Motor Truck through the Desert; Small Houses Were Placed on Trailers

Modern engineering skill has made possible the moving of a city over fourteen miles of unbroken trails on the Mohave desert in southern California. The new town, Lone Wolf, is on the plateau 5,000 feet above sea level. Formerly located one-half mile off the main desert highway, it was decided to move the city, which is used as a health resort, to a more secluded and desirable location. Accordingly, a site was purchased, trails blazed, material ordered and 250 men recruited. The transportation of 260 tons of houses, wagons, cots, machinery, trees and other such items was accomplished in twenty-four hours. Ninety-eight five and ten-ton

trucks with several trailers were used for the actual moving of the old city. Because of the rough desert dirt roads, it was necessary to block the springs solid to prevent the houses from rocking too violently as they rode over ridges.

CIGARS ARE CUT FOR SMOKING AND HAVE DRAFT HOLE

Cigars that do not need cutting or biting off at the end before being smoked are furnished by a London dealer. The tips are sheared off after manufacture and a pin about two inches long, headed with a top similar in color to the tobacco leaf,

Wegfield View, Tupton
Via Ross. Chesterfield
England. POPULAR ME

POPULAR MECHANICS

1739 29

Using the Practice
"Hole," and Close View
Showing Tabs and
Flexible Center

is pushed in. This does not detract from the appearance of the cigar and all the customer has to do is to pull out the pin and light up without fussing with the weed to get it to draw well.

STUDY MYSTERIES OF NERVES
BY ELECTRIC TESTS 182

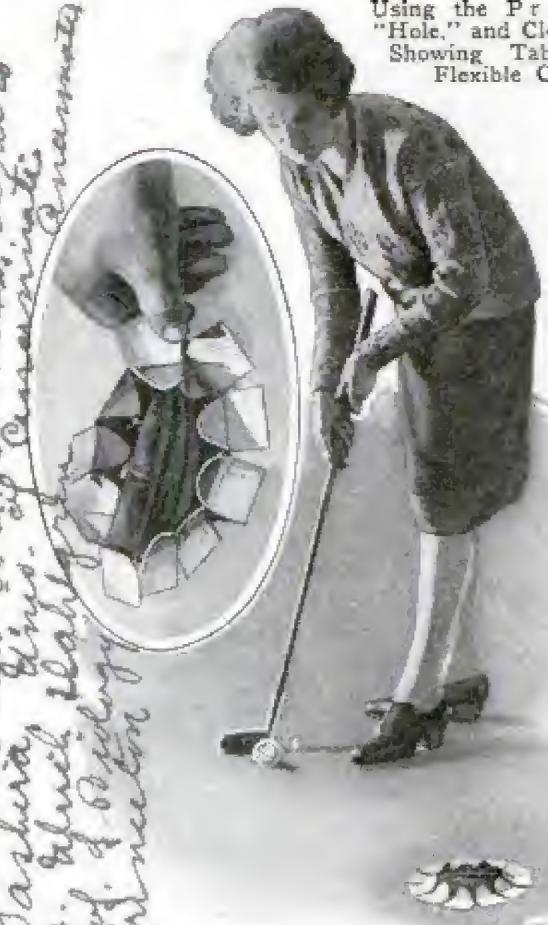
By application of various electrical principles, scientists are endeavoring to learn more of the nature of the nervous system, sometimes regarded as a sort of storage battery. In one laboratory, the current of a nerve of the body has been picked up by a wireless receiving apparatus: in another, electric fish are being studied for what light they may shed on the human mystery. A Japanese scientist is reported to have discovered that a nerve will not conduct impulses unless surrounded by an abundant supply of oxygen, indicating why some persons think and react more rapidly than others whose blood is deficient in oxygen. While impulses going along a nerve fiber are said to be accompanied by electric changes similar to those that attend the passage of current along a wire, the nerve current suffers no loss in intensity, or voltage drop. This indicates, scientists believe, that the nerves have a way of regenerating the current, as does the amplifying apparatus installed in long distance telephone systems.

AUTO ELEVATOR RAISED BY AIR ELIMINATES PIT

Operated by the air-compressor system, which is usually a part of the regular equipment at automobile service stations, an elevator simplifies the task of greasing or repairing cars. It takes the place of the pit and makes a long trestle platform unnecessary.



Car Hoisted on Compressed-Air Elevator Is Accessible to Repair Men and Quickly Lowered



PRACTICE GOLF PUTTS INDOORS WITH FLEXIBLE "HOLE"

Skill in putting is half the game of golf in the opinion of some players, and to develop proficiency in this phase of the sport, a round pad, lined with tin tabs to trap the ball, permits practice indoors or on the links. Its inner diameter is about the same as that of a regulation hole, and as the ball rolls over the rim, it is stopped by the raised projections on the other side. The tabs may be bent to any desired angle and the entire unit may be carried in the pocket or in the golf bag.

SUBSTANCE HARD AS DIAMOND
MADE FROM TUNGSTEN

MADE FROM TUNGSTEN

are promising to replace diamonds in glass cutting, polishing and other operations, a substance just as hard has been prepared ~~at~~ at a steelworks in Prussia, according to reports. It is formed by melting a mixture of tungsten and tungsten carbide in an electric furnace at a temperature of 3,000 degrees Centigrade. News of the discovery coincides with reports that carbon has been melted by a German chemist. The preparation of fused or molten carbon is the first step toward the making of synthetic diamonds.

Mr. Richard S. Dow,
222 Eastern Ave,
Gloucester, Mass.

30

1895

POPULAR MECHANICS



Curtain Attached to Grooved Strip and Close View of Molding Section Showing Slot

CURTAINS HUNG FROM MOLDING INSTEAD OF POLE

Special molding, with a groove in which short lengths of dowel stock are inserted to hold screweyes, for attaching curtains, has been devised as a substitute for poles. It is readily applied to any casing, may also be used for suspending coat hangers, eliminates the need of special fixtures and cannot fall down. An added feature is that it does not collect dust.

RESTING IMPROVES "TIRED" ROADS

Concrete pavements, like people, get tired and are benefited by periods of rest, tests at the university of Maryland have shown. When vehicles pass over a section of cement road, it is deflected to a certain degree so that the paving is set into a sort of wavelike motion. Where the traffic is heavy, this movement may be repeated many hundreds



For Rainy Days, a Pair of Long Spats Keep Mud from Stockings and Are Warm

of times an hour. The experiments have shown that, after continued rapid application of the load, the normal elasticity of the concrete is overcome, the "fatigue" limit is reached, and the material cracks. If long rests were given, however, the substance regained its ability to resist the applied forces. The tests were given under conditions that duplicated as nearly as possible actual road factors. Scientists are watching with considerable interest the application of a new kind of cement which is said to develop greater strength in concrete within twenty-four hours, than the ordinary Portland variety does in twenty-eight days. If the substance fulfills its promise, it would be possible to build a road with it one day and open it to traffic the next. Further studies are being conducted to determine more fully the properties of this cement.

POWER OF NIAGARA DOES WORK OF FORTY-FIVE MILLION MEN

In all some 1,467,000 horsepower, equivalent to the energy of 45,000,000 able-bodied men, is derived from the hydroelectric plants run by Niagara Falls. By far the larger share is taken from the Canadian side, where four big stations, developing 110,000 to 600,000 horsepower each, are located. The largest was recently completed at an expenditure of nearly \$40,000,000 after eight years of work. About ninety-five per cent of the flow of the river passes over the Horseshoe fall, which has a width of 2,600 feet as against 1,000 feet for the American fall. In building the last big power station, engineers tapped the river above the falls, thus increasing the drop of the water to the turbines to 300 feet.

SPATS PROTECT LADIES' HOSE

Close-fitting spats, extra-long and of attractive material, have been found practical on rainy days to keep spots from women's light-colored stockings. Besides acting as a shield, they are warm and comfortable and can be pulled on and off as easily as socks.

Prof. D. Steinberg Research Board
of the Research Council

Sold by Balchnek & Co,
Boston, Mass.
1887

13
Sold by Marshall & Snelia
1887

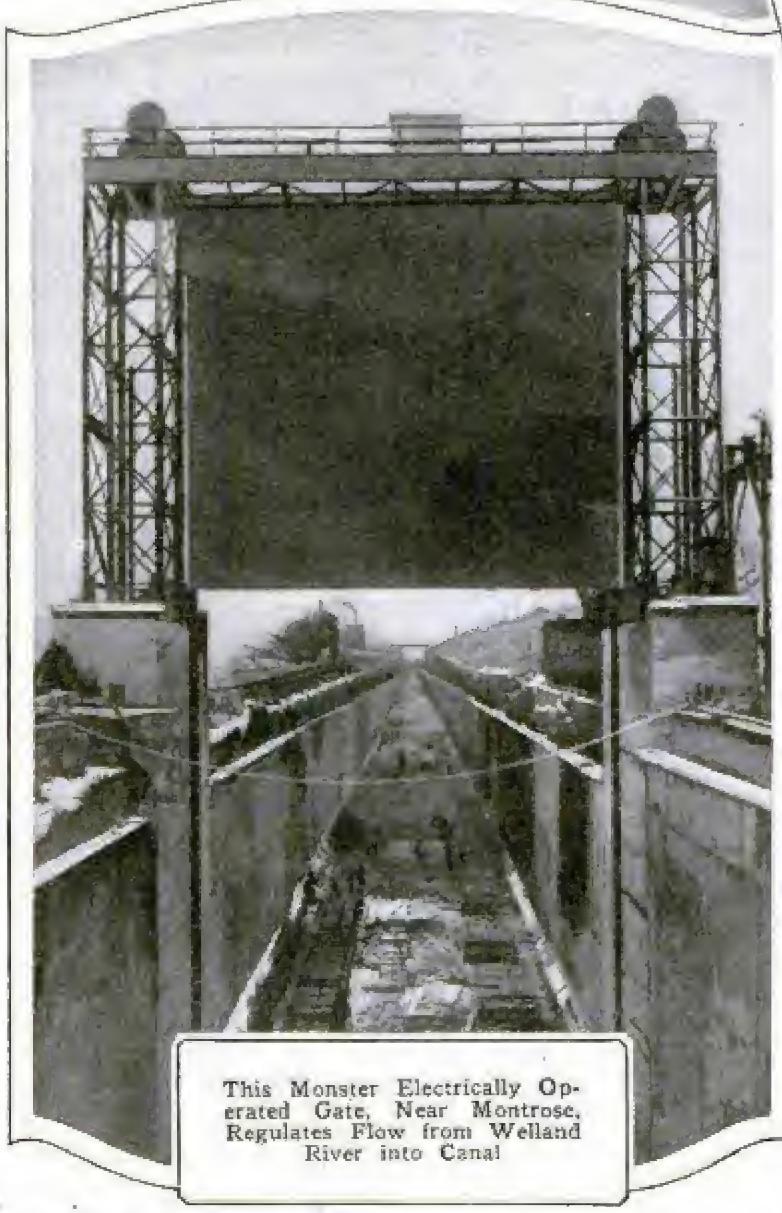
160
NIAGARA'S BEAUTY MENACED BY POWER PLANS



Largest of the Niagara Falls Power Stations; It Is on the Canadian Side and Generates 425,000 Horsepower



Part of the River Is Diverted into This Power Canal Spanned by Mighty Bridges



This Monster Electrically Operated Gate, Near Montrose, Regulates Flow from Welland River into Canal



Completed Canal across Niagara Peninsula; Will Commercial Development Such as This Destroy the Cataract's Beauty?

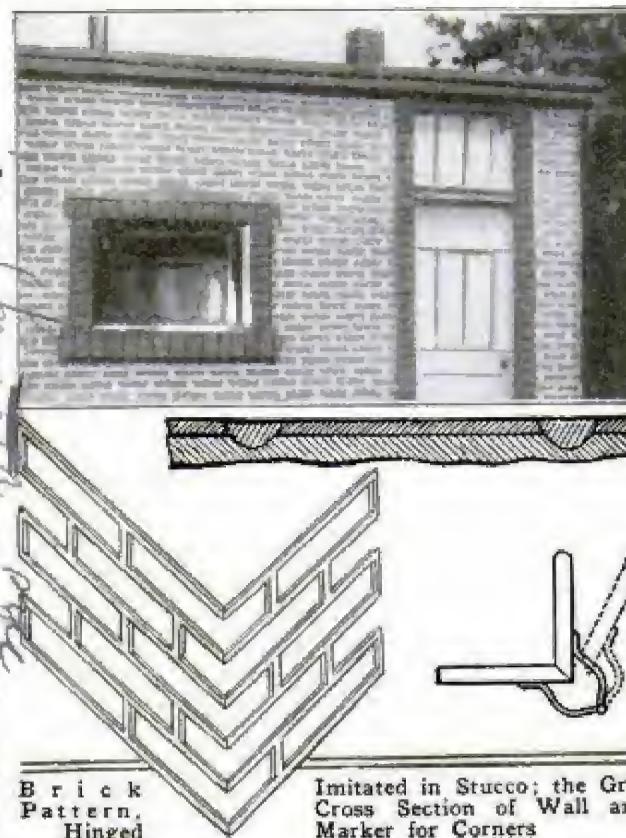
Henry C. Kennedy,
32 Luxemburg, Mo.
1532 POPULAR MECHANICS

Plaumpeld
N.J.

32

BRICK IMITATED IN STUCCO

WITH GRILL MARKER



Henry C. Kennedy, Luxemburg, Mo.
March 1926

Stucco and plaster can be marked to resemble brick, block or stone by using a grill with members arranged in a pattern like those of mortar joints. Hinges are provided for using the marker around corners, and the pieces that produce the joint lines are flat on the upper surface and triangular or rounded on the underside. In practice, the usual first coat of cement is placed on the lath and the marker imbedded in the material. The finish coat is then applied and the form removed, leaving grooves corresponding to those in masonry.

TELEPHONE ON FREIGHT TRAIN REDUCES NUMBER OF STOPS

By means of a telephone connecting the caboose and the cab of a freight train with seventy-three cars, the engineer and conductor of an eastern line held conversation recently, saving the need for hand signals and speeding the progress of the train. As they were pulling out of the yards, the conductor notified the engineer that a car-repair man was riding in the caboose and would get off at the east end of the yard and close the switch when the train was on the main track. This saved slowing up, and later the engineer notified the conductor that, if conditions were satisfactory with regard to the train,

he would not stop for water at the next station. Permission to proceed was given, sparing another delay. The wires were strung over the tops of the cars.

1692. 11/11/26

PLANE WITH TEN PROPELLERS TO HOLD HUNDRED PERSONS

What will probably be the largest airplane in the world is now under construction at an eastern plant. It will have ten propellers, as many engines and will weigh 100,000 pounds and is intended to carry 100 passengers. Patents have been granted on the design of the cabin. It is arranged with two tiers of seats at right angles to a center aisle. Only seven of the motors will be used in actual flight. The plane is to be constructed to fly in all sorts of weather, the builder declares, and is expected to prove practical from a commercial standpoint because of its enormous capacity. Other novel features include a system whereby the plane can receive fuel while in flight.

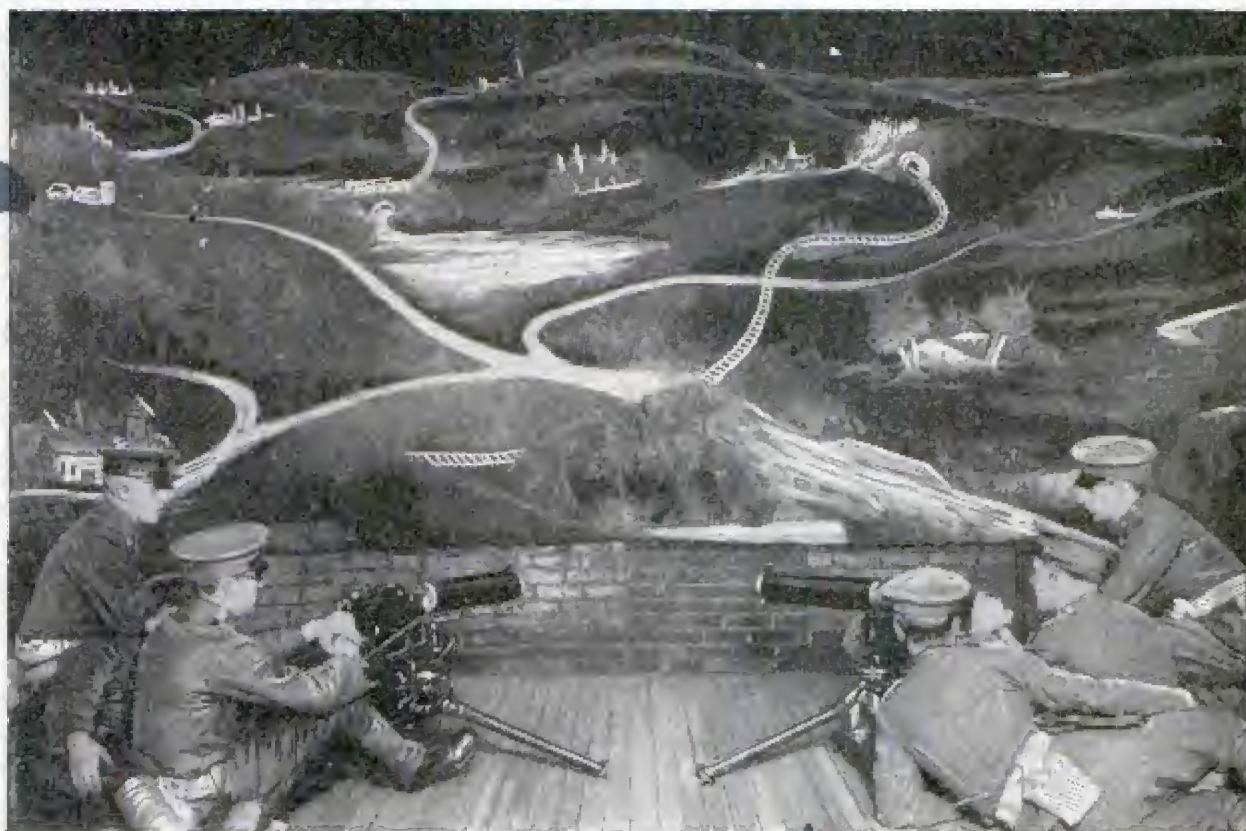
1609 SMALL MOTOR-TRACTOR CRANE LIFTS HEAVY WEIGHTS

Capable of lifting heavy weights and quickly manipulated, a small motor-driven crane is attached to a tractor unit for easy changes of position and access to places that could not be reached with larger equipment. The apparatus has been given successful tests in Germany where it is being used in manufacturing plants, on docks and for similar tasks.



Motor Cranes Being Tested at Bell Foundry

Art Wayne Agency, Inc. International



Learning How to Shoot without Firing; Landscape Target Machine Gunners Used for Sighting Practice; Villages, Bridges and Roads Were Indicated in Realistic Proportions on the Canvas

LANDSCAPE TARGET IMPROVES GUNNERS' AIM

Machine gunners of a Massachusetts regiment use a landscape target for sighting practice. It consists of a large painting on canvas and depicts bridges, houses, roads, etc., to represent points a battery would aim at under actual war conditions.

FAMOUS HISTORIC GEMS ARE REPRODUCED IN CRYSTAL

Exact reproductions of the world's most famous diamonds have been made of rock crystal and semiprecious stones, fused to reproduce the proper shade of each gem. The collection took eight years to complete. The immense labor involved in preparing these replicas calls attention to the amount of work necessary to shape, cut and polish the real stones.

The diamond is an unattractive bit, resembling a piece of alum or sugar crystal when it is first picked from the mine clay. To prepare it for the jeweler's display case, it must be cleaved or cut, shaped and polished. The first process is done with what is technically known as the diamond saw. It cuts through the grain and the process requires great care and constant watch for imperfections which would throw the saw off and spoil the prospects for a perfect diamond. The difference in weight between the rough stone and the finished gem varies from a third to sixty per cent. From one of the diamond mines 6,000,000 loads of blue ground, weighing 1,600 pounds each, were removed and only one-fourth of a carat in diamonds found, showing that the stones are often exceedingly rare even in the rough. Heavy taxes are also partly responsible for high diamond prices.



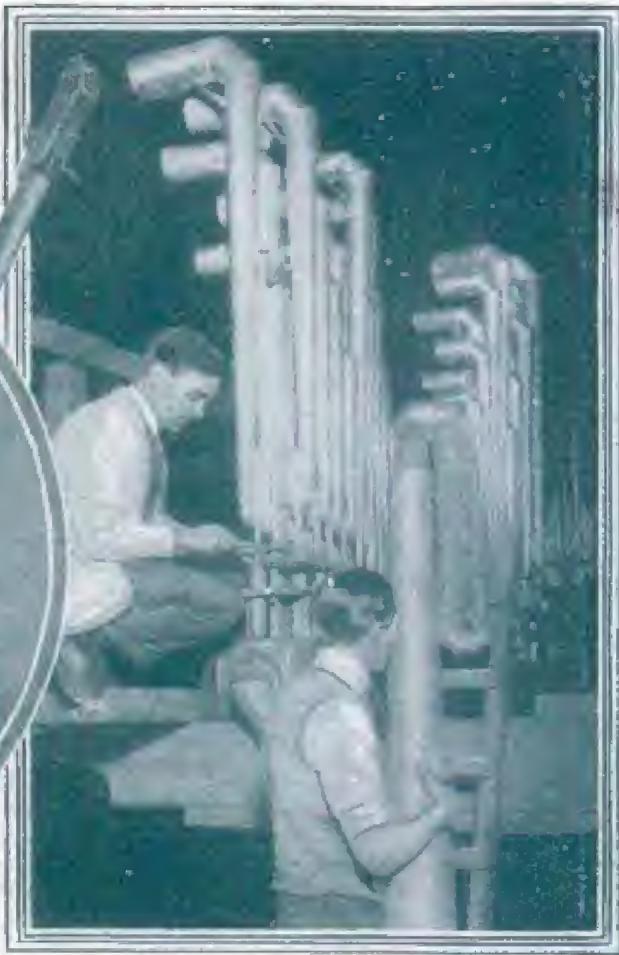
Replicas of the Famous Diamonds of History; the Models Are Made of Fused Crystal

1408

Weird Pipes and Drums Turn the Sounds



Weird Music, with a Jazzy Native Rhythm Is Produced on These Queer Stringed Instruments in the Forest Wilds



Civilization's Version of the Native Pipes, Part of the 4,500 Being Assembled in the New \$20,000 Organ of Westminster Cathedral



A Band of Wandering Minstrels in Java with Their Bamboo Onglongs, Each of Which Is Tuned to a Separate Note

of Nature into Wild Harmony of Jungle



Not a Ouija Board, But a Tom-Tom Played by the Girls of Kandy, in the Hills of Ceylon; the Drum-head Is Struck with the Knuckles



A Japanese Instrument, Called a "Moon" Which Looks like a Banjo and Has Very Similar Tones

Wooden Instrument of Africa, Combining the Tonal Effects of Drum and Xylophone

Girl Flute Player of Kyoto, Japan, Appearing Incognito in Public with a Reed Basket for Disguise

COUNTRY CLUB IS BUILT ON ROOF OF SKYSCRAPER



Looking Down on the
Roof-Top Gymnasium, and Some
of the Workers Using Equipment
during a Noon Recreation Period

Nearly all the facilities of a modern country club are provided for the workers of a New York firm in an outdoor gymnasium on top of the building. The equipment includes a running track, hand-ball court, miniature golf course, steam room, hot and cold showers, sun baths and massaging quarters, besides rowing machines and other exercising paraphernalia. Instruction is given by competent teachers, and the head of the firm declares that, since the system was installed, there has been a marked increase in the efficiency of the workers and great improvement in their health.

CATTLE THROWN INTO OCEAN TO SAVE SHIP

As a result of the forced drowning of a number of cattle during the voyage of a British ship recently, regulations have been passed requiring that vessels carry

ing cattle or other animals to British ports be provided with suitable mechanical killing instruments to insure humane slaughter. The stock ship "Manchester Producer" had just left Halifax when it ran into a furious storm. On the upper deck were more than 300 cattle in ordinary pens. For four days it was impossible to feed or water the animals properly. To relieve their sufferings, the boat was steered slightly out of its course so that the craft would not ship such heavy seas. The move proved disastrous, for the steering gear broke under the strain and the vessel drifted entirely at the mercy of the ocean. To keep the boat from sinking, the cattle had to be driven into the sea. Several days later the ship was picked up, virtually a derelict.

Cont. on page 14
Next Day
P. G. Canada

RIDING SAFER THAN WALKING
ROAD COMMITTEE FINDS

Regulation of pedestrian traffic deserves greater attention, according to a report of a committee to the second national conference on street and highway safety. The investigators found that automobile drivers have made considerable progress in learning what to expect from other drivers and how to avoid collisions, but no such improvement has been achieved when autoists and pedestrians meet. Incompetence in automobile operating was held due to ignorance of regulations and customs, insufficient strength or quickness in controlling the vehicle, defects of sight or hearing, defective intelligence, or temperamental or emotional inability to do the right thing in a sudden emergency.

EGGS EXAMINED WITH CAMERA
FOR ESTABLISHING GRADES

Department of agriculture photographers use an interesting method for reproducing in colors the inside of eggs in connection with grading. The picture is taken in front of a lantern-slide projector; then the camera lens is removed and the artist colors the pictures to make exact reproductions of the inside of the eggs as seen through the empty camera. Lithographs of the colored drawings are made later and distributed among egg canders throughout the country to aid them in classifying eggs uniformly. According to government figures, some 5,000,000 farms produce eggs, so that the establishment of definite grades is of great importance.



Coloring Egg Pictures After They Are Photographed from Projector

Cont. on page 112 N. W. Moran 3825



Curtain on Roller Rings, and Close View of Unit Showing Position of the Bearings

CURTAIN RINGS WITH ROLLERS
SLIDE EASILY ON ROD

For hanging shower-bath and other curtains, rings with two rollers that slide along the rod, eliminate sticking and the necessity of pulling with risk of tearing the fabric. They are easily attached and operate on almost any size or kind of smooth rod.

MOVING PEAK IN SWITZERLAND
SLIPS SIX INCHES YEARLY

Daily measurements of the Motte d'Arbino, a peak 5,500 feet high in Switzerland, show that its summit is shifting horizontally at the rate of four inches a year and that it has sunk more than six inches during the last twelve months. The top of the mountain, covering an area of 100,000 square feet, has become dangerously undermined, observers report, and declare that, should the underlying rocks give way, the entire plateau would crash into the valley. Precautions already have been taken to prevent loss of life in case this should happen. Records of the peak's movements have been kept since 1888.

near Bellinzona

324 W. Washington Street



Making Motion Pictures of a Tulip's Growth and Blossoming; under Favorable Conditions the Development Is Extremely Regular

PLANTS GROW ON SCHEDULE SLOW MOVIES SHOW

1817 Under proper conditions and using artificial light, plants can be grown on schedule, slow-motion pictures taken by an eastern firm have shown. It was discovered that some plants progressed from tight buds to a full bloom in exactly forty-five minutes. The study was considered valuable as promising an adaptation of the system to "forcing" plant life

HOW TO TELL TIME BY STARS AT ANY SEASON OF YEAR

If the stars in the northern sky are visible, you can set your watch by them within fifteen minutes of the correct time and without the use of complicated tables. The Pole star is considered as the center of a huge clock and the pointers of the Dipper, the hour hand. The numeral six will be below the Pole star and twelve above. Taking the time as indicated by the Dipper's pointers, you add to that figure the number of months that have elapsed since the first of January to the nearest quarter month. The resulting sum is doubled and subtracted from sixteen and a quarter. If the result is more than sixteen and a quarter, subtract it from forty and a quarter. The answer is

and Mr. W. W. Merriman, *Kleen Traps*, 44

the time in hours after noon. For instance it is late September and the pointers of the "sky clock" correspond to the position of the hour hand at seven o'clock. Eight and three-fourths months have elapsed since New Year's day. This is added to seven, making fifteen and three quarters. Double this is thirty-one and one-half. Subtracting from forty and one quarter gives eight and three quarters or 8:45 p.m.

OLD NEWSPAPERS BLEACHED AND USED AGAIN

1678 Old newspapers are reported to be transformed into sheets as white as the original so that they can be used again by a bleaching process that

has been developed at Cornell University. The method does not greatly change the nature of the pulp, it is said, although there is a loss of about ten per cent, and the cost is a fraction of a cent higher per pound than the present price of newsprint due largely to the high cost of the papers and the limited scale of the experiments. A method for removing ink from book and magazine paper has been in use for some time, but similar processes have been considered too expensive or work too great changes in the pulp to make them practical for application to newspapers.

By Mr. G. H. Aldred, Professor of Industrial Chemistry

TRAY IS FITTED TO ARMCHAIR FOR WRITING OR READING

1740

Easily attached to the arm of an upholstered chair, a small tray is found useful for holding writing or reading materials, teacups or smoking set. It can be tipped to various angles and is held in place by a weighted band which slips over the arm of the chair. The

same arrangement is provided with a work basket for sewing materials.



With the Wasps of the Sea

By LIEUT. H. R. THURBER, U. S. N.

"SQUADRON flag's heading this way, sir; flank speed pennant flying," cried the executive officer of the destroyer.

"All right," the captain shouted back. "Tail in behind her. We're going over to join the troop transports. Look out for the convoy-formation signal."

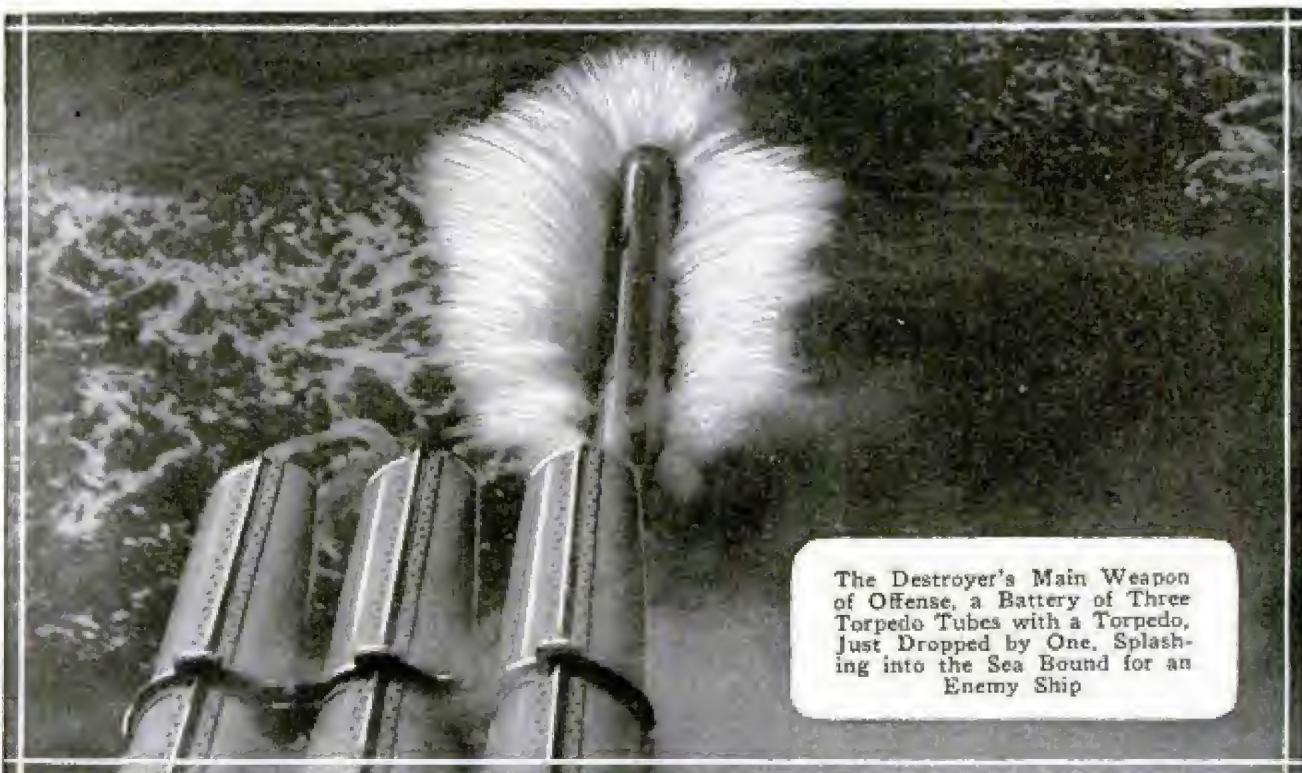
It was the beginning of a peace-time war problem in which the forces of the army and navy were about to clash. A day of tropical April sunshine had passed without event as we steamed toward the southwest, the troop transports snuggling close under the protecting wings of our squad-

*1717-20th M
7-4 Washington D.C.
ron. Around the battleships was drawn another cordon of cruisers and destroyers.*

As the shadows of the Pacific night closed in, a flapping line of flags shot up to the yardarm of the flagship. "Zigzag plan five." The signal dropped and the ships of the convoy began their "zig," sliding from one course to another with precision, like well-drilled squads of marching soldiers on parade.

All the officers were on the bridge after a hasty dinner, watching, toward the west, the last lingering light sifting up from below the horizon into the dusk. A sig-

The Destroyer's Main Weapon of Offense, a Battery of Three Torpedo Tubes with a Torpedo, Just Dropped by One, Splashing into the Sea Bound for an Enemy Ship



nal from the flagship, "Cease zigzag," was executed. The fleet forged ahead silently, bulky, lightless, toward its landfall.

"Hello! There's the army!" exclaimed the captain, as a faint fan of white whisked over the sky there almost dead ahead. Then, another. Searchlights.

"Hm'min. Shouldn't use searchlights, I should say," commented the captain. "What's time?"

"Ten-fifty, sir."

"Very obliging of them. Another check on our navigation. We're right on time. At eleven, we change speed

As we crept into the black gloom of the inner bay, a sudden, soaking rain squall blotted out all sight of the splotchy shore line and swept away visual contact with the convoy.

"We've about arrived, captain," said the executive officer from the other side of the bridge. Even as he spoke, I heard a smothered clinking of anchor chains easing out through hawsepipes. Before that, there had been no sound except the hum of our fireroom blowers.

"Troop ships are on station, sir."

"Very well," replied the captain. "We take up a continuous patrol round them



Half Black in the Shadow of the Plane's Wing, the Long, Slim, Polished Tube of a Torpedo Drops Swiftly from Its Cradle beneath the Airplane to Dive and Speed Away under Water

to five knots. North-coast battleships leave us then, and we slide into the bay with our soldier boys."

We could just see the black-towered silhouettes of the battleships as they started away from formation, heading for their bombardment station ten miles off the coast. But in a few minutes they vanished from view. Only once did we have an inkling as to their exact whereabouts, at eleven-thirty, when there was the faint sound of a deep-voiced whistle to the westward, and running lights of one ship flashed on, then out.

"Must have had a collision, or a jammed rudder," the executive officer said.

Follow the ship ahead, distance about five hundred yards."

Out to seaward, a light flared in the sky, fluttered downward, snuffed out. Another one! After the last, continued blackness.

"Enemy airplanes dropping flares. Or, perhaps, better still, star shells from the ships, simulating gunfire," hazarded the captain. "Bombardment started, theoretically, you know, at midnight to prepare the way for disembarking troops."

I tried to picture the actual firing of the ships, as they steamed slowly back and forth out there offshore, splitting the night with long red belches from the great



A Night Version of "Painted Ships on a Painted Ocean." Looking like an Animated Cubist Painting, Marks the Celebration of the Battle Fleet When It Returns after Maneuvers; at the Right Is a Forty-Knot Destroyer under Full Steam



The Mosquito Squadron of Destroyers Laying Down a Smoke Screen to Conceal the Arrival of the Battle Fleet from Discovery by the Enemy

guns and sharp flashes from the secondary batteries. Shells chugging, landing with flaming bursts on their objectives, hurling crumpled masses of rails and buildings high into the night air, blasting great holes in the terrain, setting on fire the cane fields. Anti-aircraft batteries, spitting fiery tongues at enemy bombers and torpedo planes which were endeavoring to attain the exact position to launch their missiles, while fighting planes of both forces were in a whirling, flaming melee around them. Destroyers were lashing the waters for lurking submarines.

At three o'clock, by the beams sweeping afar from the enemy searchlights, I saw our troops disembarking from the transports, and shortly after heard the staccato put-put of the launches moving with their tows through the darkness, shore-bound. An anxious half hour passed. Then, I heard firing, saw sharp, stinging flashes of small arms and artillery. It lasted for about three minutes, then ceased abruptly, leaving us to the stillness of the waters lapping past our sides and the eerie quiet which comes to the tropical shades just before dawn.

Cautiously, the faint light of the new

day began filtering through the graying heavens. Troops began pouring from the transports. String after string of loaded boats moved in line abreast toward the beach, which was beginning to show its thin, white surf line between the irregular clumps of foliage above it and the hazy water below.

Our squadron, on signal, formed column and commenced a simulated bombardment to cover the beach landing. By four-thirty, the reflected light of the morning sun peeped over the southward-sloping chain of mountains to the east. The transports weighed anchor and began moving to seaward.

"There come the planes!" came a cry from the fire-control tower. There was swift activity on deck. The anti-aircraft and machine-gun crews, donning gas masks, swung their gun sights toward the approaching targets. The men at the four-inch battery wheeled their gun muzzles upward.

The small "flight" streamed over two of the retreating transports, then swooped down to attack the last of the shore-bound troop boats. Bombs and ammunition expended, they sped away.

The bell from the radio room rang and the operator shouted up the tube: "Mississippi is torpedoed by a sub; judged sunk." Through my binoculars I could see the first wave of boats from the battleship naval regiments—equipped with radio and artillery—starting toward the outer point. The minesweepers were moving inshore, taking in tow the emptied boats of the marine landing force.

"Here's another flight!" the executive officer sang out. He called them off as he examined them through his glasses. "Nine bombers par-



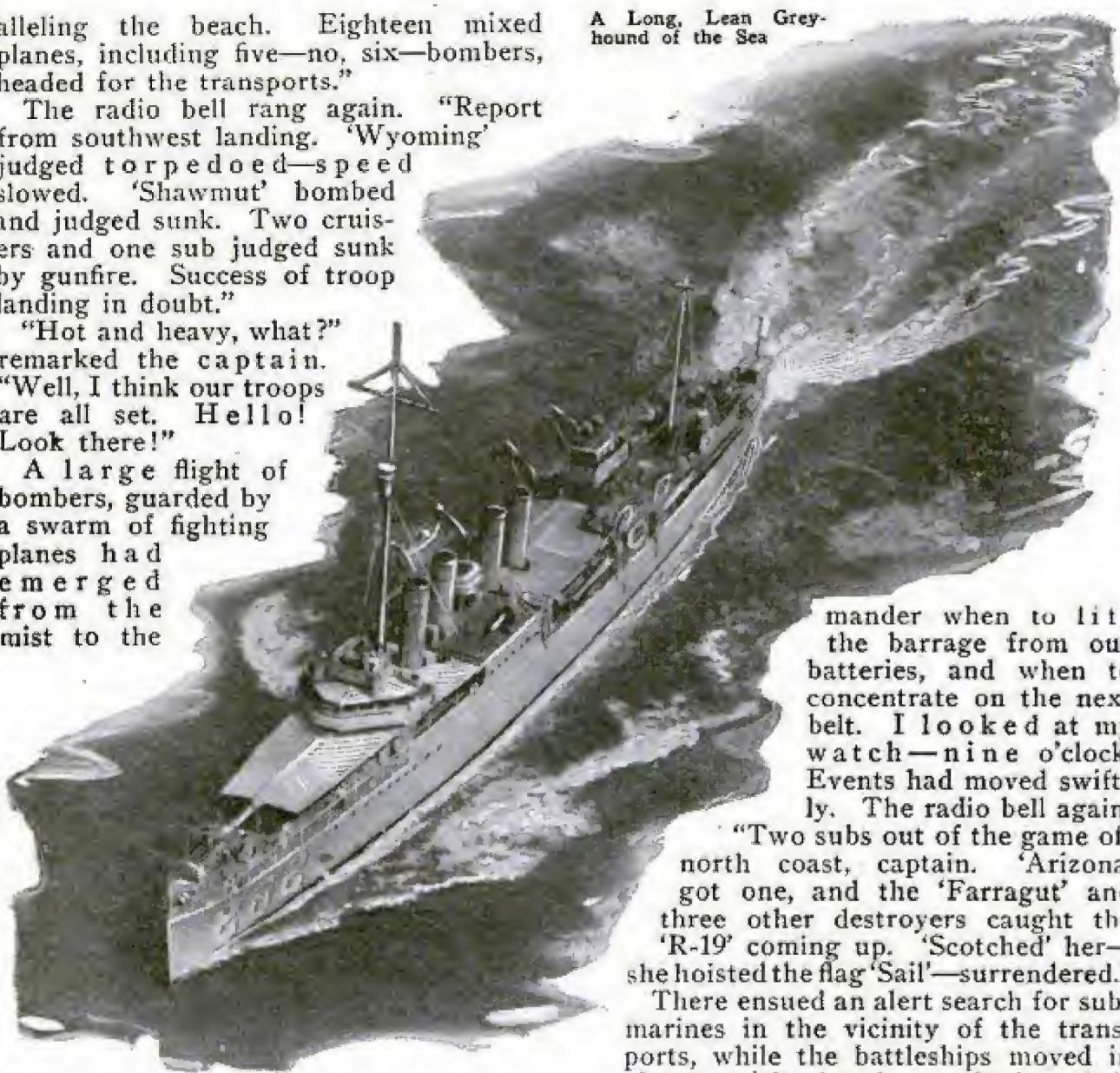
alleling the beach. Eighteen mixed planes, including five—no, six—bombers, headed for the transports."

The radio bell rang again. "Report from southwest landing. 'Wyoming' judged torpedoed—speed slowed. 'Shawmut' bombed and judged sunk. Two cruisers and one sub judged sunk by gunfire. Success of troop landing in doubt."

"Hot and heavy, what?" remarked the captain. "Well, I think our troops are all set. Hello! Look there!"

A large flight of bombers, guarded by a swarm of fighting planes had emerged from the mist to the

A Long, Lean Grey-hound of the Sea



southwest, setting a course toward us. They passed high overhead, the low-pitched hum of the heavier planes mingled with the drumming zoom of the diving, cavorting fighters. Floating through the air came glistening cones—simulated bombs. Wheeling out toward the battleships and cruisers, they advanced to their attack, worried and broken somewhat by a counterattack that suddenly shot from a cloudbank over their formation.

The radio bell. "Message from our radio beach boat," the executive officer shouted. "Landed marines without difficulty." The captain nodded. "Looks as though we're doing well. But the war's not over. If the umpires judge we survived that bombing flight, we're still clearing the way with our battery, you know, for the marines."

We continued our patrol and simulated bombardment. The radio beach boats, in contact with the commanding general of marines, informed the squadron com-

mander when to lift the barrage from our batteries, and when to concentrate on the next belt. I looked at my watch—nine o'clock. Events had moved swiftly. The radio bell again.

"Two subs out of the game off north coast, captain. 'Arizona' got one, and the 'Farragut' and three other destroyers caught the 'R-19' coming up. 'Scotched' her—she hoisted the flag 'Sail'—surrendered."

There ensued an alert search for submarines in the vicinity of the transports, while the battleships moved in closer to the beach, continuing their simulated bombardment in advancing barrages, disrupting the enemy's resistance.

From the "Seattle" the chief umpires sent a message to the radio room. The captain himself answered the tube. "Signal from chief umpires, sir. Cease present exercises."

"Secure from general quarters," said the captain. "War's over."

Later the umpires decided that the attack would have resulted in the capture and occupation of the land position.

19/16

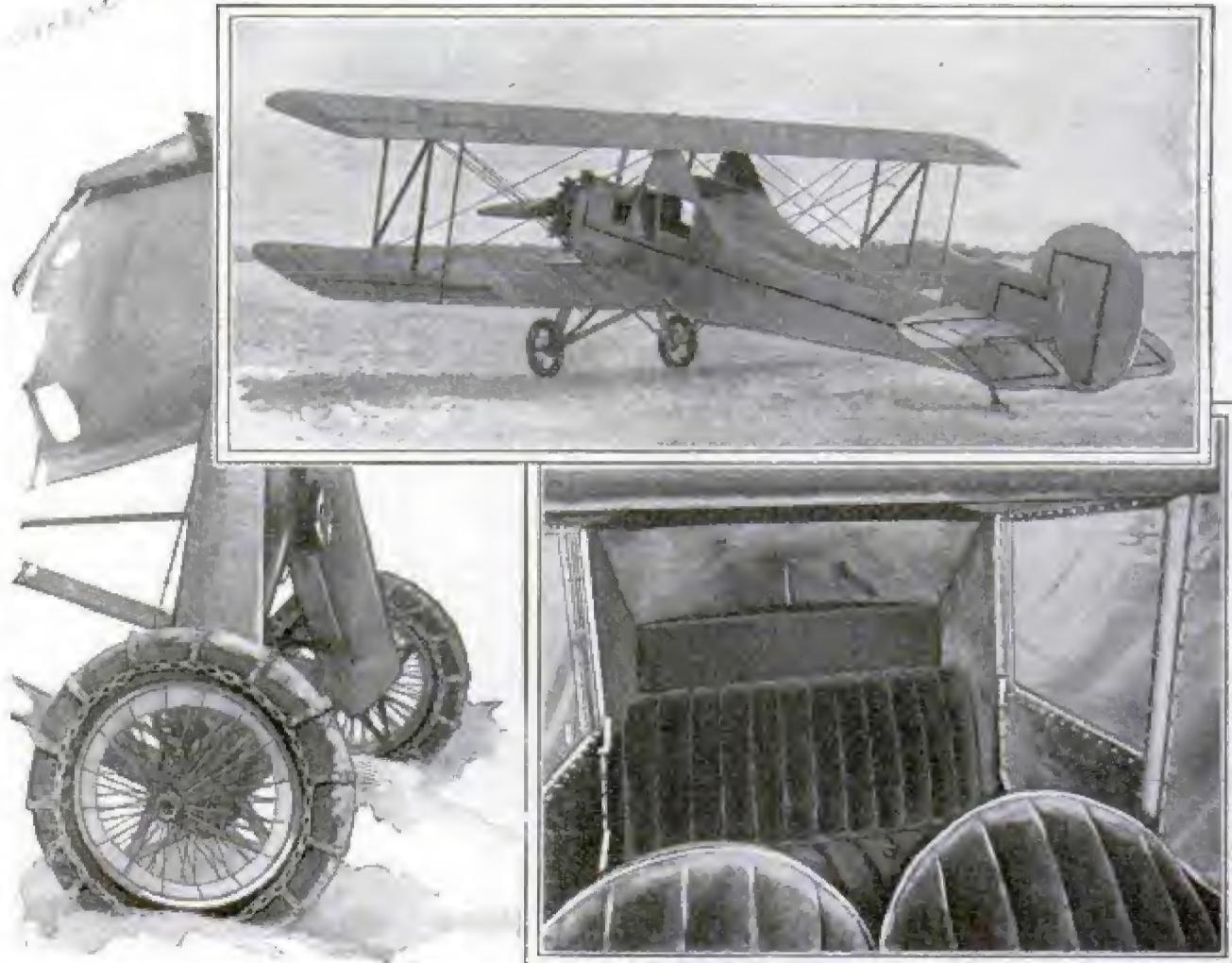
MOVIES NOT HARMFUL TO EYES

If you can read, write or do other work without tiring your eyes, there is no harm in going to the movies, specialists in eye diseases say. Tests with 150 persons showed that those who suffered eye fatigue after watching a motion-picture film, also became tired when doing other work that affected the vision, so that the movies were not responsible for the trouble.

*Mr. A. O. Gravne
and Mr. Weymann*

*Chicago Evening Post
4/23/23*

PLANE HAS BRAKES ON WHEELS FOR QUICK LANDING



View of Stinson's Latest Airplane, Features of Which Are the Roomy and Comfortable Cabin for Passengers and the Wheel Brakes; Chains Also Aid in Landing on Snow and Ice

Greater safety and comfort are promised in a cabin-type airplane devised by Eddie Stinson, veteran pilot. It will carry four or five passengers and is said to have such stability that it will straighten out in a flying position when the pilot removes his hands and feet from the controls and throttles the motor. A mechanic is not needed at the "hop-off," as the plane has an electric self-starter, nor is it necessary to use chock blocks to keep the plane still while the engine is warming up, for there are brakes on both wheels. These hold the craft to the ground and are released by the pilot when he gets ready to start. The brakes will also permit landing in small areas and chains on the wheels will prevent sliding long distances even if the ground were covered with ice and snow. Another feature is the arrangement of the exhaust from the motor. It has been carried to a point below the cabin to decrease the noise and allow passengers to converse without having to shout or make signs. Plush carpeting, provision for smokers and a heating system for comfort:

in cold weather are additional conveniences of the cabin. The pilot is so placed that he can see the ground directly beneath him, the wheels of the landing gear and also the ailerons and stabilizer. The plane is propelled by a 200-horsepower motor, develops a high speed of 125 miles an hour, 105 miles for cruising and a landing speed of forty-five miles. Besides the passengers, it can carry 300 pounds of mail or freight, seventy-five gallons of gasoline and seven and one-half gallons of oil. It is twenty-eight feet long and has a span of thirty-three feet nine inches.

RADIO-TUBE BASE MATERIAL ALSO USED FOR ANVILS

Tougher than cast iron, almost as hard as a diamond, moisture-proof and capable of being machined accurately, isolantite, a recently prepared material, is being used not only for radio-tube bases, and spark plugs for airplanes but for the small anvils employed in automatic can-making machines. There it withstands acid flux,

flame, melted solder and hammering for an average performance of 100 days. Other materials, glass, metal and stone last but a day or so at the most. This substance is prepared from a powder so fine that, if a cupful of it is poured out, only a small amount reaches the floor, the rest floats around in the air. It is molded into rods or blocks under pressure and under the action of a chemical that causes the minute grains to stick together. Pressure alone will not produce this effect. While the blocks are still soft, they are cut to the required length and the pieces finished to the desired form, just as metal units are worked up, then fired in a gas furnace. Since the material contains no water, it can be exposed directly to the flames. When a temperature of about 2,800 degrees Fahrenheit is reached, the material is held at this point for sixty seconds, during which it changes its character, becoming suddenly harder than any other substance except diamond. It can be threaded both inside and outside, and is said to have even greater strength than metal, so that an iron screw would be stripped rather than the isolantite threads. If a dish of it is dropped twenty feet to a concrete floor, it may chip the cement, but the article itself will not break.

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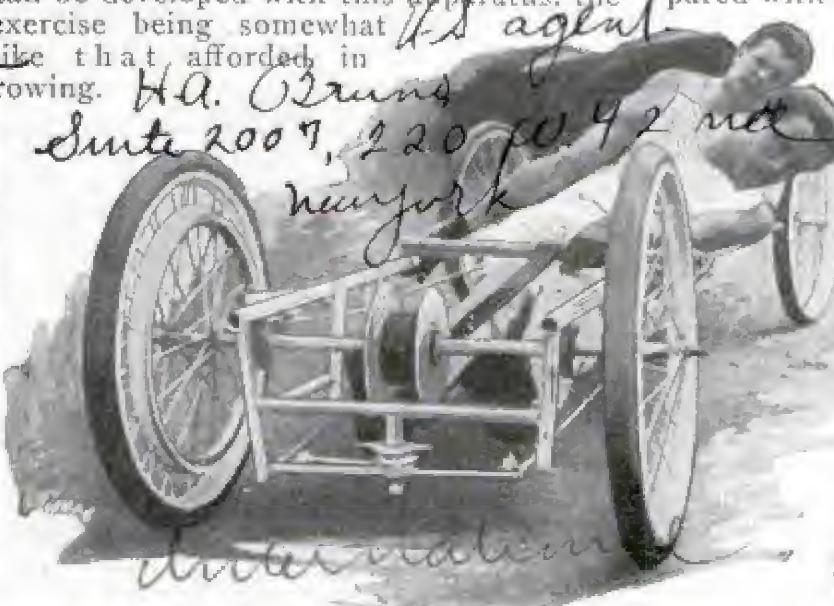
RACER DRIVEN BY MAN-POWER AFFORDS THRILLING SPORT

Propelled by a belt-drive actuated by pulling on levers, a racing car for two persons has attracted considerable attention in Munich. A spring arrangement on the belt wheels throws the lever into gear for a fresh pull at each stroke. High speed can be developed with this apparatus, the exercise being somewhat *U.S. agent* like that afforded in

rowing. *H.A. Evans*

Suite 2007, 220 42nd Street

New York



Racers Putting Forth a Burst of Speed in Their Belt-Driven Car; the Forward Operator Is Also Steering

Probably Curry Lardstuff

SHOTGUN WITH REVOLVER GRIP

LATEST POLICE WEAPON

1513

Carried in a shoulder holster and firing regula-



Loading the Short-Barreled Shotgun; It Is Carried in Shoulder Holster and Fired like a Revolver

tion 16-gauge shells, a short-barreled shotgun has been included in the equipment of the bank squad of the Los Angeles police department. It has a revolver grip and, besides being effective at close range, is easy to handle in emergencies.

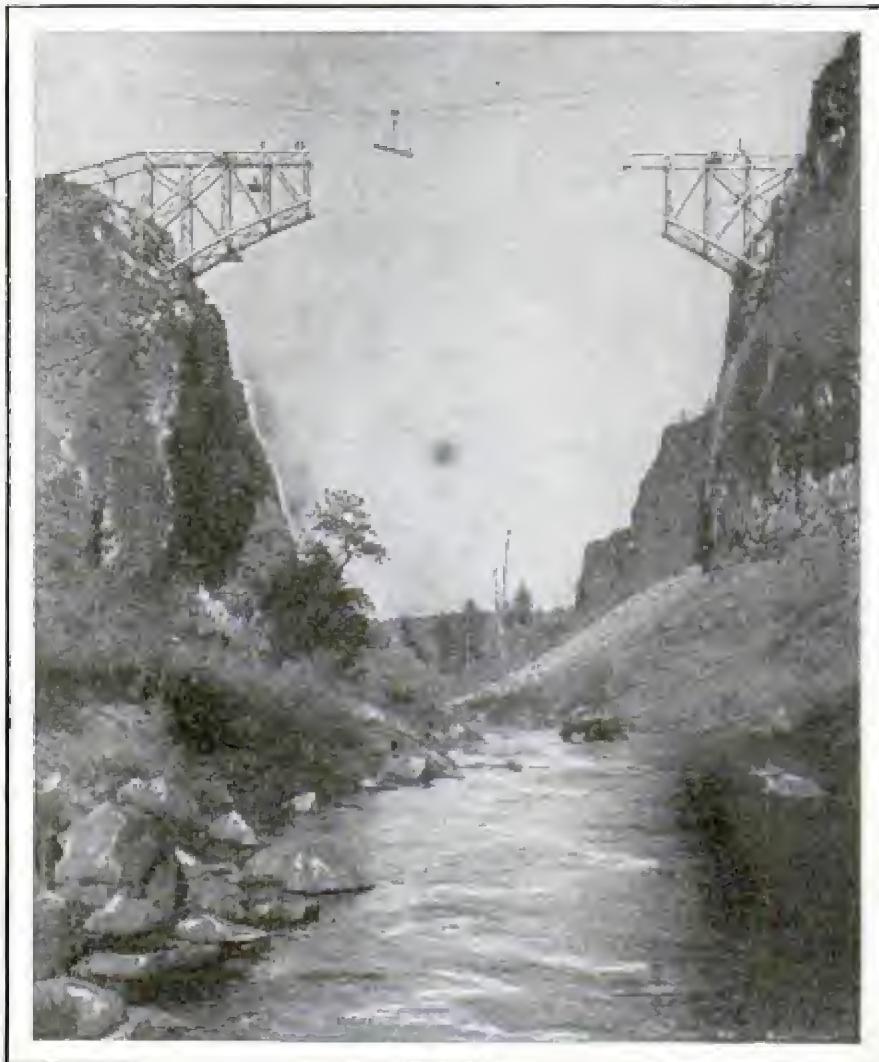
ENGINE SMOKESTACKS SHRINK AS BOILERS GROW

1825

The short smokestack of the larger types of locomotives is conspicuous as compared with the stacks of some of the older but smaller engines. The reason for this is simple. Clearance at overhead crossings has remained a fixed factor and the boilers in the big locomotives have been built up almost to the limit, so that it is impossible to erect long stacks on top of them. When electric trolleys appeared, some engineers predicted that they would speedily supplant steam on every

line in the country, but the locomotive has steadily persisted, and now individual gasoline-driven cars are on the rails, modeled after the automobile rather than after the trolley.

Herald Tribune
4/13/26



Steelworkers Pitting Their Skill against the Elements to Shorten an Auto Road; Crooked River Canyon Viaduct

CANYON BRIDGED WITH STEEL FOR AUTO HIGHWAY

By the old road on the Dallas-California highway, in Oregon, it was six miles down and up the other side of the Crooked river canyon, a difficult stretch for autos or teams. Travelers are now spared this descent and climb by a steel bridge, said to be the highest vehicle viaduct in the world, that has been built across the canyon. It is 351 feet high, 360 feet long and cost \$125,000. Because of the loose nature of the rock, the edges of the cliff had to be dug back twenty-five feet to afford a secure foundation, and the high winds blowing through the canyon made the erection of steel difficult and hazardous. To support the bridge before the last units were in place, four hydraulic jacks, two on each side, with a pull of 160 tons per pair, were used. They were held by large concrete deadmen, and the bridge was kept from swaying by guy cables.

Thirty-one towns in the United States have been named after Franklin.

ELEVEN-MILE-LONG RADIO WAVES TO CIRCLE GLOBE

Broadcasting on an 18,000-meter wavelength will be done from the giant station near Rugby, England. The towers are over 800 feet high and some 800 miles of wire has been buried six inches below the surface of the ground near the masts. The tremendous electrical activity set up around the station when the transmitter is in operation is represented in diagram on the opposite page. It is seen that the waves do not ripple evenly from the broadcasting aerial but radiate from the magnetic field between the antenna and the earth. The actual transmitting area lies between the ground wire and the exposed aerial hung between the masts. Moving at the approximate speed of light, more than 186,000 miles a second, the waves arise from every point in the field and

are not just from one, as had to be indicated in the sketch. They are spherical in character, centered on the aerial and while generally enlarging, they have a constantly secondary back-and-forth expansion and contraction, alternately leaping ahead and falling behind the general advance. Opposing electric and magnetic forces on the aerial, throw out electromagnetic waves, the wireless waves. The positive charge produces the crests and the negative, the downward surge.

SMALL DYNAMO IN FLASHLIGHT REPLACES BATTERY



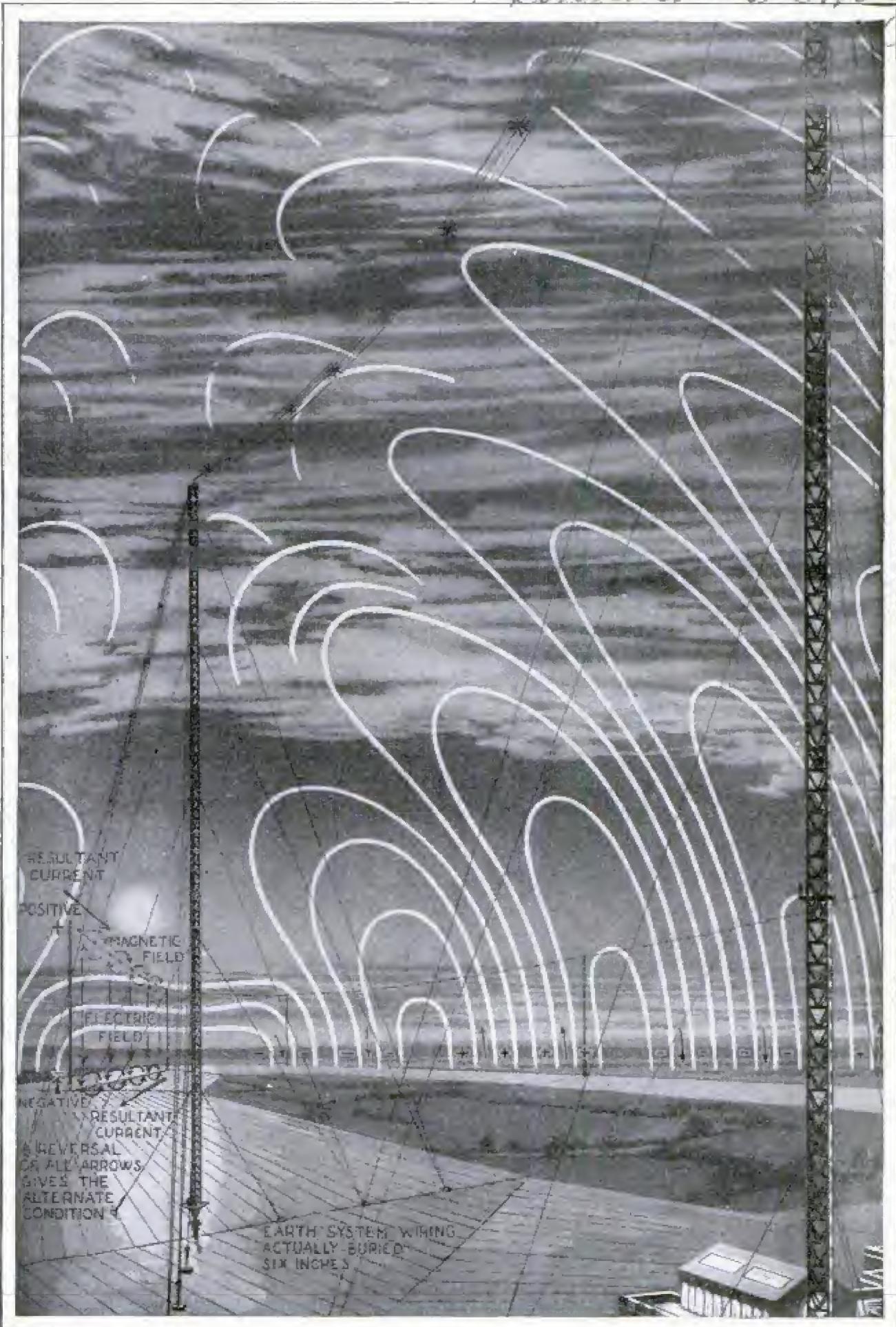
conveniently modeled grip for handy use and is easily carried in the pocket.

A pistol-shaped flashlight, introduced in England, requires no batteries, as current is supplied from a tiny dynamo operated by pressing a trigger. It has a

Theo and C. L. Arleton U. Liverpool

18, Shakespeare Road,
Leytonstone, London, E. 24, Eng.

How Big Wireless Waves Go Through Air

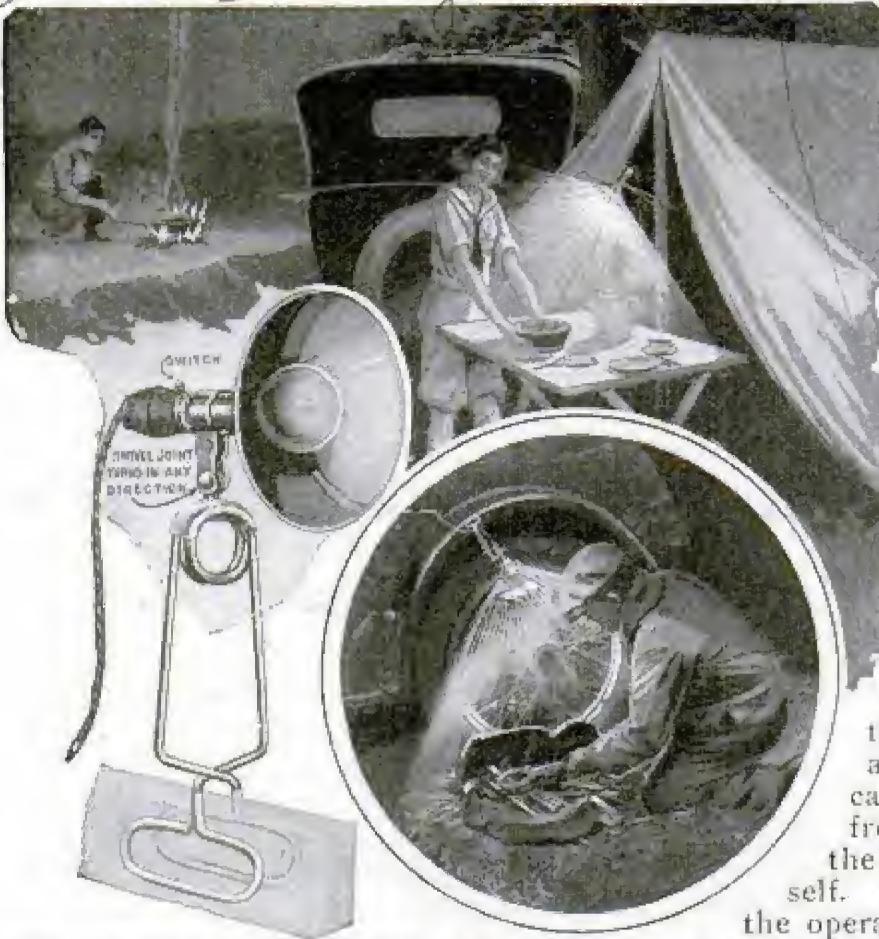


© S. W. Clatworthy

Artist's Drawing of Supposed Course Huge Radio Waves Take as They Leave the Giant Station near Rugby, England; They Arise from the Magnetic Field between the Aerial and the Ground Wires

48 209 S. State St 4400 Perkins Ave
180 3 Chicago Cleveland, O.

POPULAR MECHANICS



Close View of Lamp, Showing Clamp, Joint and Switch, and Its Uses on Auto Trip

AUTO LIGHT HELD BY CLAMP TURNS ON SWIVEL

When trouble occurs while traveling by auto at night, an extension electric light with a strong clamp is found useful. The spring clasp can be fastened to almost any object and is covered with rubber to prevent scratching smooth surfaces. A reflector of nickelplated brass affords a strong, clear light, while a swivel joint permits turning the lamp in any direction. It also serves as a spotlight or may be used for lighting the tent or camping space when illumination is needed.

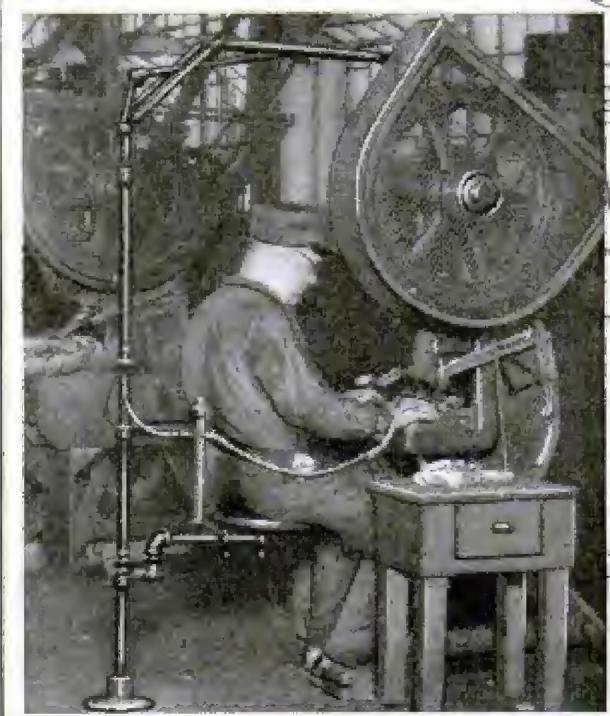
EIGHTY-YEAR-OLD RARE STAMP VALUED AT TEN THOUSAND

184 Worth only five cents at the time of its issue but now valued at \$10,000, a rare old stamp of the Alexandria, Va., post office of 1846 has just been acquired by an eastern collector. It is the third of its kind found so far. Apparently, the issue was on sale for not more than a week. The stamp is circular in form, slightly larger than a quarter dollar and is printed, not engraved. The government had not yet begun to issue stamps at that time, allowing postmasters to provide them if de-

sired or collect postage in money. The stamp narrowly missed being burned up with a lot of worthless papers which a widow had sorted out from the belongings of her husband. The name of a friend, still living, was mentioned in the letter. It was shown to him and he suggested that the stamp "might be worth a few dollars" to some collector.

HANDS ARE PULLED FROM DANGER IN PUNCH PRESS

1420 Punch-press operators are furnished a protective apparatus in the form of an attachment that automatically pulls the hands away from the danger zone, should the person forget to do so himself. Cords attached to wristlets the operator wears are so connected to the ram of the press that when it descends, the hands are pulled back where they are out of danger. The "harness" is easily unfastened by means of snap hooks and a comfortable swiveling seat for the press operator is fixed to the supporting column of the safety apparatus.



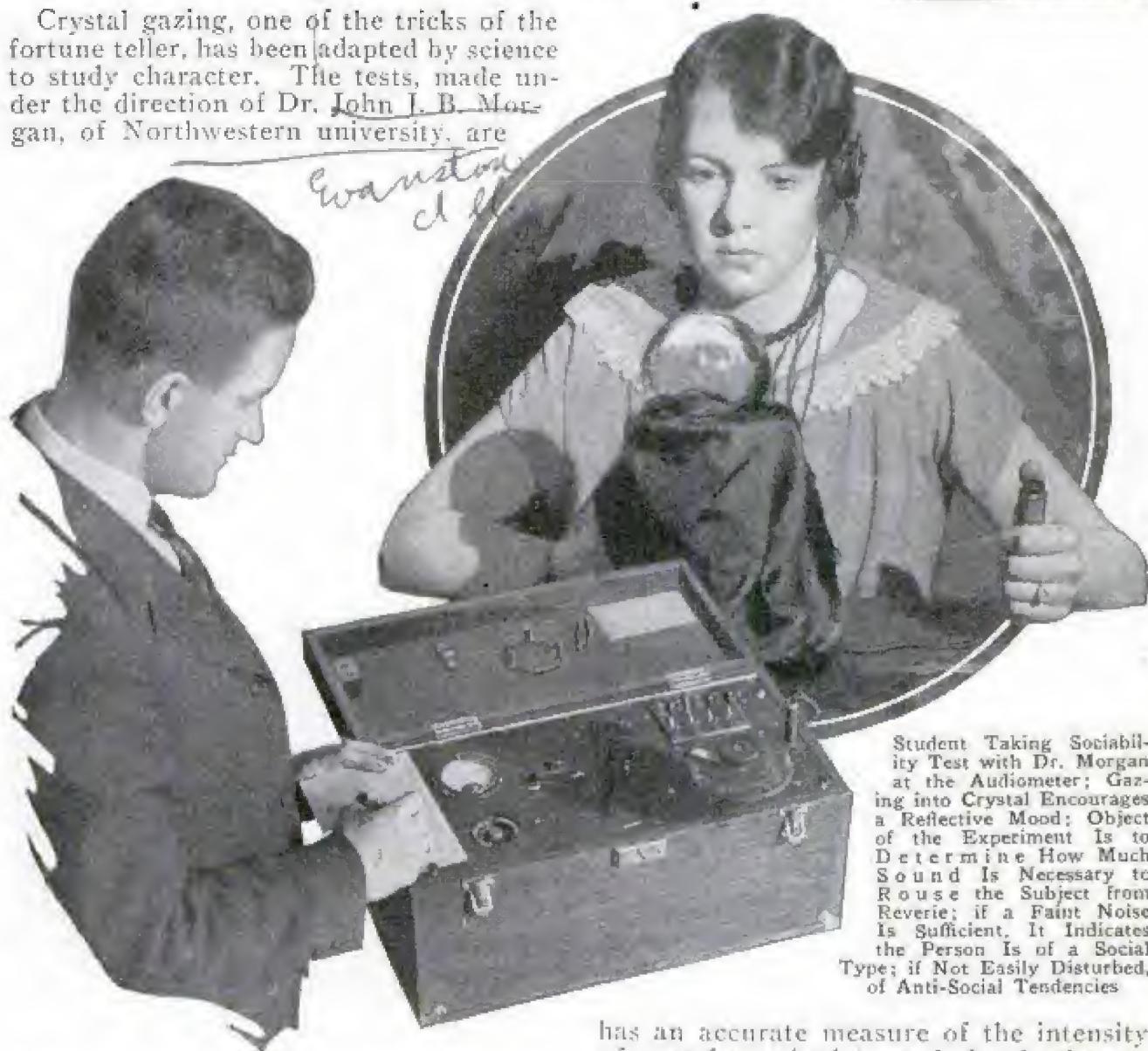
Punch-Press Operator's Hands, Tied to Safety Guide, Are Pulled Back if He Does Not Move Them

Bought by Perry W. Fullers

ms) Chicago, Ill. Co.

CRYSTAL GAZING GIVES CLUE TO YOUR CHARACTER

Crystal gazing, one of the tricks of the fortune teller, has been adapted by science to study character. The tests, made under the direction of Dr. John J. B. Morgan, of Northwestern University, are



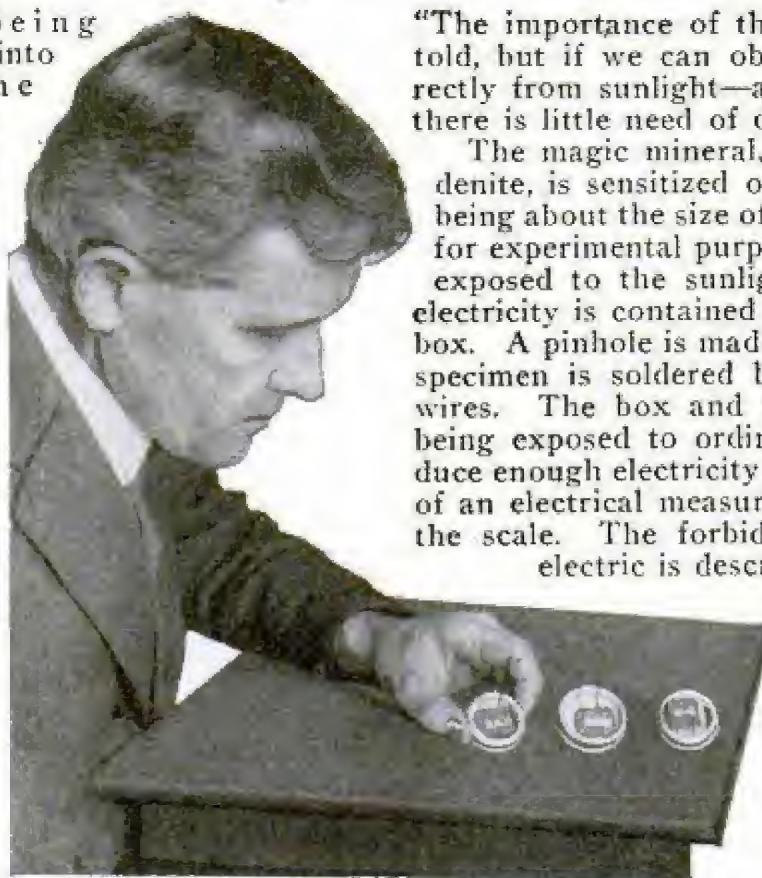
Student Taking Sociability Test with Dr. Morgan at the Audiometer; Gazing into Crystal Encourages a Reflective Mood; Object of the Experiment Is to Determine How Much Sound Is Necessary to Rouse the Subject from Reverie; if a Faint Noise Is Sufficient, It Indicates the Person Is of a Social Type; if Not Easily Disturbed, of Anti-Social Tendencies

designed to show the degree of the subject's sociability. The crystal is placed in a dark room and the subject is seated in a chair before it and told to relax, think of nothing in particular, make no effort to hear anything and just daydream while gazing at the soothing green light that comes from the ball. Earphones are put on and there is a push button in the subject's hand. Close by, in an adjacent room, the professor is standing by an audiometer, used in measuring hearing. After ten or fifteen minutes he releases the tone of middle "C" into the earphone. The ears already have been tested with the audiometer so the professor knows how keenly the subject hears under normal conditions. The tone's intensity is gradually increased. As soon as the subject hears it, he presses the push button. This lights a little red lamp, informing the professor that the sound has broken through the subject's reverie. He now

has an accurate measure of the intensity of sound required to end the daydreaming and that mark the examiner regards as the index of your sociability. If roused by a faint sound, even fainter than heard when alert, the subject is considered of the social type. If an intense sound is needed, he is rated as a person of anti-social type. The reason this test is considered a good measure of personality, Dr. Morgan explains, is that the subject does not know what is being tested and his response is beyond his control, so that it may be regarded as a basically true index. Persons of the suggestible type readily adopt the mood of reverie, do not worry about anything in particular while taking the test, and so are not on their guard. When the sound comes, they are thus likely to hear it even when it is faint. On the other hand, subjects of the so-called negativistic type become suspicious of the experiment, their attention is divided among a number of things they fear may happen and so they miss the sound.

1920 MAGIC MINERAL CHANGES LIGHT INTO ELECTRICITY

Sunlight is being transformed into electricity at the United States bureau of standards. Without any intermediate medium for generating electric current, a mineral exposed to the sun produces a small but perceptible amount of electricity. The discovery of a means for changing light directly into electric current—though only achieved on a miniature scale—foreshadows the possibility of tapping the sun as a source of power for turning the wheels of industry, operating trains and street cars, and lighting our homes. "We have found a substance that apparently transforms light into electricity," is the authorized statement of Dr. William W. Coblenz, of the bureau.



© Harris and Ewing
Pill Boxes of Molybdenite, Which, When Exposed to the Sun's Rays, Converts the Light Waves into an Electrical Current

"The importance of this cannot be foretold, but if we can obtain electricity directly from sunlight—and enough of it—there is little need of digging coal."

The magic mineral, known as molybdenite, is sensitized only in spots, these being about the size of a pin point. Thus, for experimental purposes, a sample to be exposed to the sunlight for generating electricity is contained in a discarded pill box. A pinhole is made in this box. The specimen is soldered between two small wires. The box and its contents, upon being exposed to ordinary daylight, produce enough electricity to force the needle of an electrical measuring instrument off the scale. The forbidding term actino-electric is descriptively applied to

the strange behavior of a substance in generating electric current when exposed to the light of the sun or of the moon or stars. The bureau is reasonably certain that the resultant prod-

uct is electricity because it has polarity. The bureau is now attempting to discover artificial means of sensitizing molybdenite or finding duplicate minerals that possess the magical properties possessed by it, molybdenite being very scarce.

1923 ROAR OF NIAGARA MEASURED WITH SOUND TESTER

Tests with an audiometer have shown that the noisiest places at Niagara falls are at the foot of the American fall, at Prospect point and directly in front of the Cave of the Winds, below Goat island. Seventy units, classified as deafening noise, were recorded here. New York's most clamorous intersection, 6th avenue at 34th street, registered fifty-five units.

1923 WINDOW SASH THAT SWINGS IN SIMPLIFIES WASHING

Permitting washing the outside from the interior of the house, a window sash that can be tipped to a horizontal position may also be lowered or raised in the usual way. It can be adjusted for effective ventilation, and a brass weatherstrip com-

bined with it prevents binding and rattling. The sash is adaptable to either new or old windows.



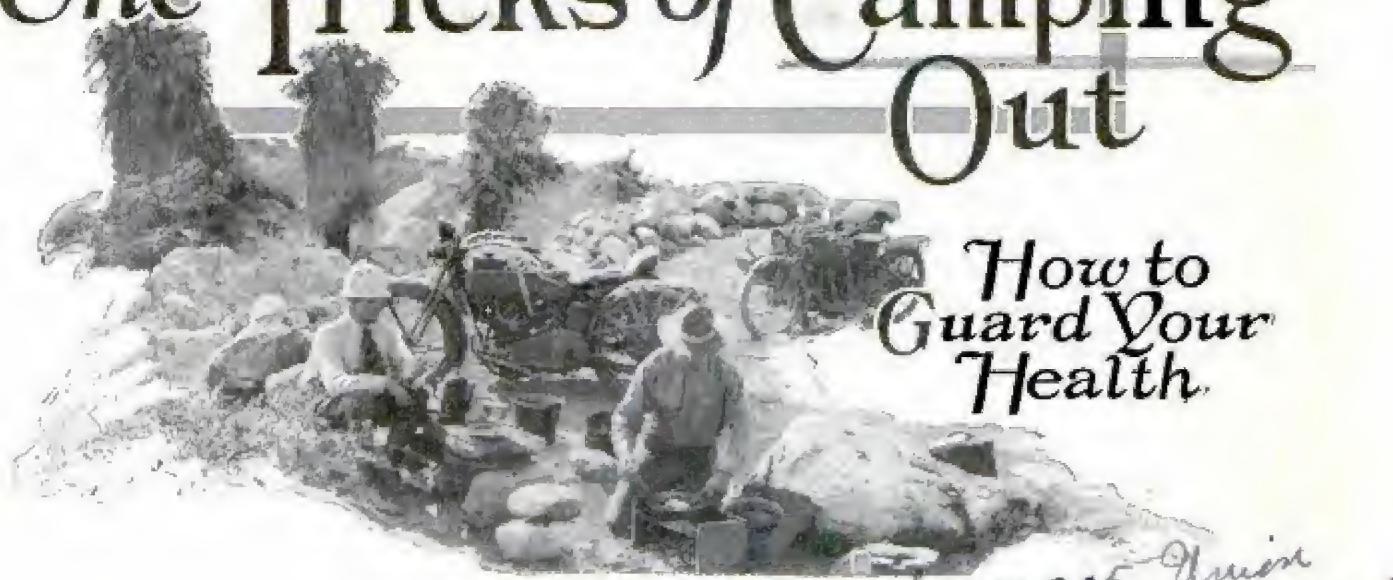
Window Swung Inward for Washing

W. H. Howard A. 502
178 Jackson Blvd.
Chicago

Chicago Daily News
Chief of Radiometry Section
47 7/2

The Tricks of Camping Out

*How to
Guard Your
Health*



By JOHN EDWIN HOAG

*Suite 206, Union
League Building, Los Angeles, Calif.*

CAMPING trips, whether a cross-country motor tour, to fish, to hunt, or merely to seek relaxation, are invariably for the purpose of retaining or improving that most precious of human assets—health. But, all too frequently the inexperienced camper falls an easy victim to outdoor ailments and physical torments.

Many a camper has been made ill, suffered untold agony, had his vacation ruined, and perhaps been sent home to recuperate, all because of ignorance of a few simple rules for keeping well. The carefree life of the camper, with plenty of pure air, wholesome food, and abundance of physical exercise, is naturally conducive to the building of robust health. The camper who gets sick is thus usually a victim of things almost wholly preventable.

Of campers' ailments, typhoid, dysentery and other forms of intestinal infections, have wrecked more trips than all other forms of illness combined. These are contracted by drinking contaminated water, eating uncooked foods, or from cooked foods to which the germs have been carried after cooking—usually by flies. One of the greatest dangers is bad drinking water. Any camper can easily eliminate this menace by boiling all water of uncertain purity. The best guarantee against typhoid, however, is to call on your physician and get inoculated against the disease before starting on a trip.

Next to intestinal ailments, common colds have sent far too many campers home. The same general rules by which people avoid taking cold at home apply to the camper. For instance, a city man

would never think of sitting down on a sprinkled pavement or in a wet gutter. Yet, I have seen many inexperienced campers sit down on damp ground, or on a log with bark that was soaking wet. There is no surer way of taking cold. If you can't find something dry to sit upon, don't sit! Squat like the Indian does, or sit on your hat.

Wool is by far the best material for camp clothing. It is insurance against colds, sore throat and all the other aches and pains that result from exposure. All good bathing suits are made of wool because there's warmth in it even when wet. If you fall in a stream, or get drenched some other way, remove all clothing immediately, and wring it as dry as possible. No matter how cold the weather, you'll be warmer, and feel better when you've wrung your clothes out. Of course, a change to dry clothing should be made as soon as possible. If such a change is not available, build a roaring fire and get dried out. Never let yourself be caught out on any kind of a camping trip without having a few matches in a waterproof container. Wet boots or shoes should be dried very slowly by hanging them upside down on sticks driven in the ground before the fire. If the job can be done in camp, fill wet boots or shoes with hot sand, gravel or small pebbles. They'll be bone-dry in a few hours.

One of the best investments toward healthful camping is a good tent. It should have a canvas floor sewed into it to make it reptile and insect-proof. There are only a few places in the United States where mosquitoes may be carriers of ma-



An Ideal Outdoor Costume, Made of Wool Throughout, No Skirts to Catch in Brush and Knee-Length Hobnailed Boots

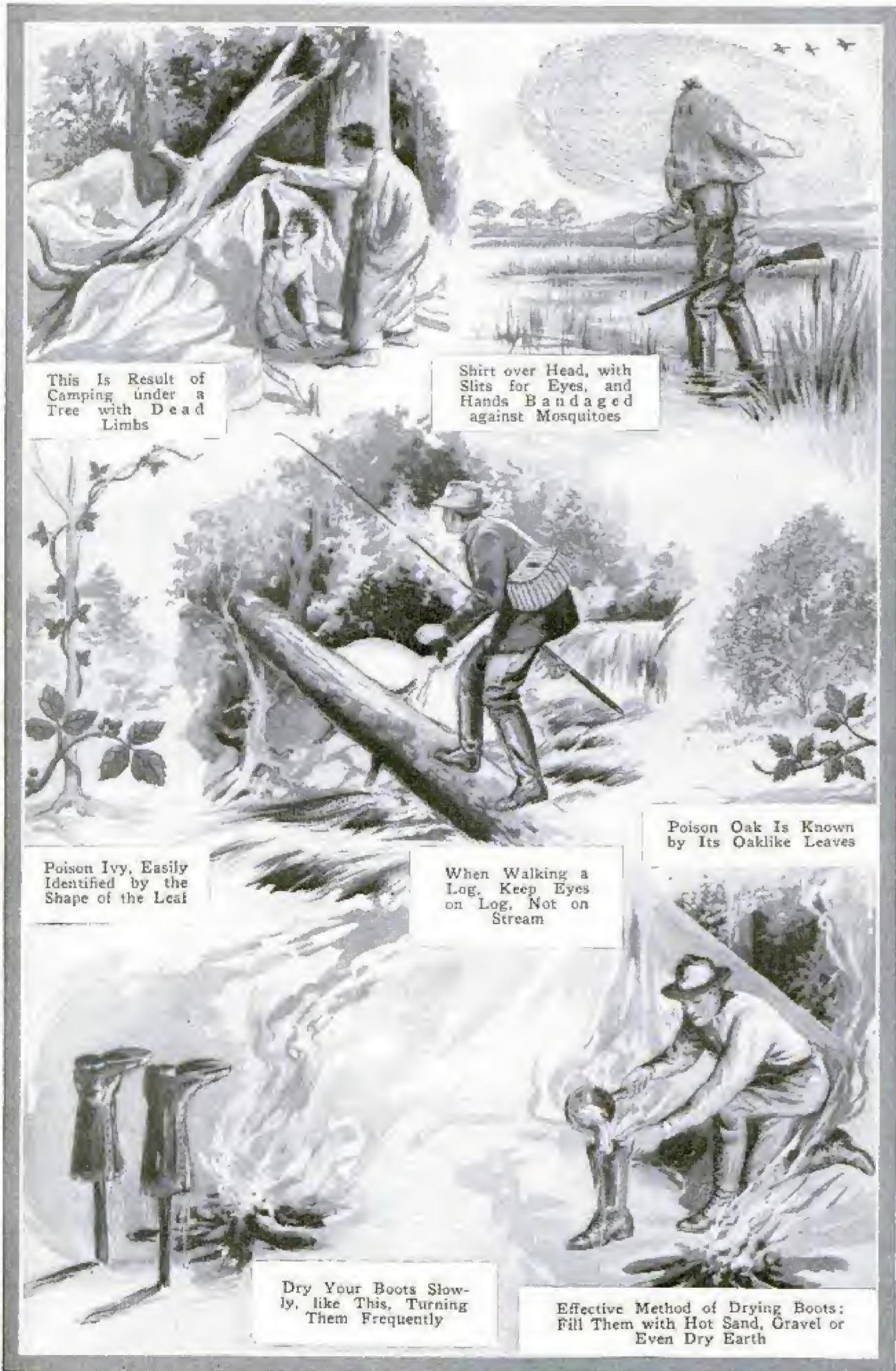
laria and yellow fever. Nevertheless, the harmless variety, found almost throughout the entire country, is a pest to cause serious discomfort to the camper who has no means of protecting himself. The mosquito-proof tent, of course, takes care of the mosquito insofar as sleeping in camp is concerned. And, in this age when most campers cook their meals on portable gasoline stoves, the tent may be used as a refuge from mosquitoes at meal time. The camper who dispenses with a tent, should provide himself with a mosquito net. It can be rolled up in one's bedding or sleeping bag. It is scant excess baggage if not needed. If it is needed, it is worth many times its weight in gold. There are, of course, times when campers come in contact with mosquitoes under circumstances when there is nothing to be done but "face the music." In such instances the only defense is lotions or smudge fires. There are many excellent lotions on the market that will keep mosquitoes away. Lacking any of these, an excellent substitute is ordinary kero-

sene. Wipe it over the face and hands, and hang a handkerchief out of the back of your hat to keep the pest off your neck. Smudge fires are a last resort when no other protection is available, but often useful for making camp even where a mosquito-proof tent is part of the outfit. At least four fires should be built at the corners of the smallest area that will suffice for a camp ground.

If one has been severely bitten by mosquitoes, or by spiders, or any kind of insect, there is no better treatment than applications of spirits of ammonia. It allays the itching almost instantly, and reduces the swelling. Iodine, which every camper should carry, is a good substitute for spirits of ammonia for the treatment of insect bites. An emergency treatment that is always available is to smear the bites with soft mud. It will be found wonderfully soothing. The same treatment also applies to the stings of bees and wasps. Buck ticks, and wood ticks, cause considerable annoyance in some parts of the country. If they cannot be pulled out, they must be dug out as a splinter is removed. A tick bite, or the wound that is left after removing a tick, should be touched with iodine to guard against infection.

The risk that the camper runs of being bitten by poisonous reptiles is by no means as great as is popularly believed. Yet, government records show 740 cases of persons bitten by poisonous reptiles last year. Of this number seventy-eight died. It is therefore advisable for all campers to be prepared for such an emergency—or better still, to know how to avoid poisonous reptiles as nearly as possible.

The precaution of the snake-proof tent has already been mentioned. A wise camper does not select swampy ground, or an area against ledges of rocks or cliffs, for his camp site. Such locations are snake territory. They are not the best camp sites anyway. No camper has any business running around barefooted. High boots, or stout shoes with leggings, are by far the best footwear for camping; and obviously, snakes haven't much chance at a person so clad. But campers do get bitten by poisonous snakes occasionally in spite of these precautions. It is, therefore, advisable for every camper





An Ideal Camp Site, with No Rocks to Give Reptiles a Hiding Place, No Bowlders to Work Loose and Roll Down on the Camp, and Good Drainage in Event Rain Should Come

to provide himself with an anti-venom kit. Such kits are sold by all sporting-goods houses. A good one should consist of a small scalpel, a ligature, hypodermic syringe, and vials of distilled water, potassium permanganate and strychnine. Instructions for use always come with the kits. In cases of snake bite with no anti-venom kit available, the best emergency treatment is as follows: If one is bitten, for instance, on the hand, the ligature, a stout string, a wire, or anything that will stop the flow of blood should be tied tightly around the wrist. The bite should then be gashed with a sharp knife, safety-razor blade or any other instrument, to make it bleed freely. After bleeding thoroughly, the ligature should be loosened slightly every twenty minutes to avoid the possibility of gangrenous mortification. This treatment, while crude, has saved the lives of many persons bitten by the most deadly of all North American reptiles, the diamond-backed rattlesnake.

Cauterization of a snake bite by fire is a painful but effective treatment. The ligature should be used, and the wound bled, after which it is seared with a hot iron, hot knife blade or stone. One case is recorded in California of a prospector who performed this operation with smokeless powder. He opened a shotgun cartridge, heaped the powder over the wound, and calmly touched a match to it. In the hospital, where he arrived forty-eight hours later, he was treated only for the powder burn. The surgeons declared he

could have chosen no more effective method for completely destroying the poison.

Having covered most of the major menaces to human health while camping, we now come to several which are not dangerous, but very annoying—such things as hay fever and skin eruptions caused by poison ivy and poison oak. The hay-fever victim has but one recourse. That is to consult a physician for a hypodermic "shot" of pollen serum. For many persons this treatment offers complete immunity. Many people are immune from plant poisons, such as poison ivy and poison oak. Those who are not immune should learn to identify these plants on sight, and then use care to keep clear of them. A serious attack of poison ivy or poison oak is a case for a physician. If no physician is available, temporary relief, and in some cases complete cures, are effected by frequent applications of strong solutions of sugar of lead (a deadly poison if taken internally), baking soda or ordinary photographers' hypo.

The foregoing topics cover the methods of avoiding most of the physical difficulties that are familiar disrupters of otherwise successful camping trips. It is impossible to cover them all in detail in this article. A few additional trouble makers may be summed up in the following

"DON'TS":

Don't kidnap a bear cub unless you're willing to go the limit with its irate mother;

Take chances with fire in the forests. See that your campfire is out before you leave. Better yet, use a gasoline camp stove;

Go fooling around bad water with hip boots on. It's O.K. if you're contemplating suicide;

Look at the water while crossing a stream on a log. Keep your eyes on the log. Test the bark before you step on it if the log is not newly felled;

Ford a swift stream if the water is more than knee-deep, without knowing what the water is like immediately downstream;

Camp under lone trees in thunder-storm country. Such trees are targets for lightning;

Camp under trees that show dead wood. A heavy piece may come down;

Camp at the foot of cliffs, or under steep slopes where you may be bombarded by falling boulders, landslides or avalanches of snow;

Camp in the west in the bed of a dry wash. A cloudburst may almost instantly turn



Above, a Thirsty Motorist Taking Chances with Typhoid, Dysentery and Other Diseases; Center, Treating a Rattlesnake Bite by Tying a Ligature above the Bite, Bleeding the Wound Freely and Then Injecting Potassium Permanganate from the Anti-Venom Kit; a Good Tent, with Sewed Bottom, Is Insect, Reptile and Weather-Proof

the dry wash into a roaring river;

Make camp on low ground on the bank of a stream. The stream may rise;

Be a dirty camper. Scraps of food thrown about may be out of your sight, but flies and ants will find them. Burn or bury your garbage and bury the tin cans;

Go into woodlands or swamps without a good compass;

Swing an ax without being sure it isn't going to catch in twigs or branches overhead or behind. It will cut human flesh as well as it does firewood;

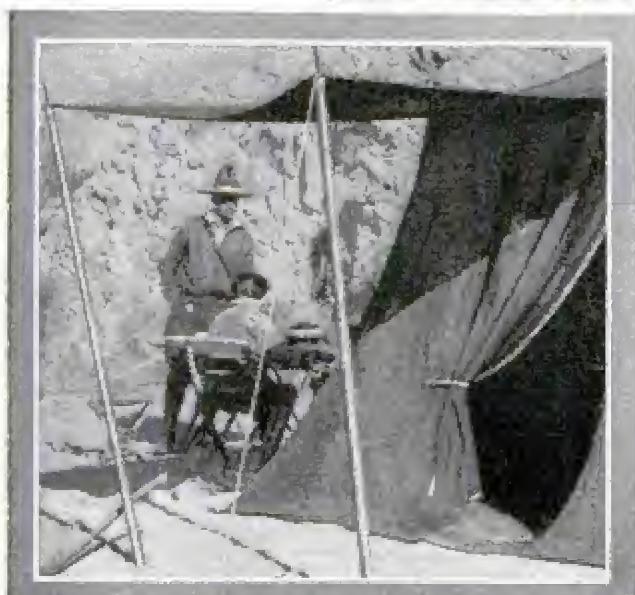
Crawl into caves. You may get acquainted with a skunk, or something worse;

Try to live out of tin cans while camping. Take time to prepare good meals;

Try to subsist upon greasy, fried food exclusively. It's a sure way to get sick. Vary the diet with boiled and baked stuff;

Take chances with rickety, or overloaded boats. If you use a derelict, test it thoroughly before you venture away from the shore;

Camp under mesquite trees in the west-



ern deserts. They are the roosting places of hawks, owls, and vultures;

Try to get along without a bath just because you're camping. Take a sponge bath, with a pint of water if water is scarce;

Go camping without a small medical kit of simple home remedies, such as salve for burns and sunburn, cathartics, dental floss, iodine and bandages;

Try to sleep on a canvas cot in a chilly climate. The canvas cot is a dandy warm-weather bed, but it gives cold comfort in a cool country, or in high altitudes;

Go into high altitudes and indulge in violent exercise before you become accustomed to the elevation. You may permanently impair your heart action;

Try to swim in high mountain lakes unless you are used to such altitudes. These lakes are cold and "crampy" and the altitude makes people short-winded under the exertion of swimming;

Go scaling around in mountainous country until you've learned something about mountaineering. The rankest amateur can climb up a cliff, where he'd have to have eyes in his toes to get down;

Leave loaded firearms strewn about the camp. Have a place for them that will eliminate possibility of accident;

Try to wade a trout stream with rubber-soled footwear. You'll skid like an automobile on a wet pavement.

Here are a few "do's":

Scoop out a trench in the ground, and make your bed in it, if you sleep cold. If you haven't a sleeping bag, put a poncho, or some other piece of moisture-

proof material, between the earth and your bed.

If weather conditions look unfavorable, prepare for the storm before it begins. It is easier to dig a trench around your tent before the rain starts. It is also far better than being floated out of bed.

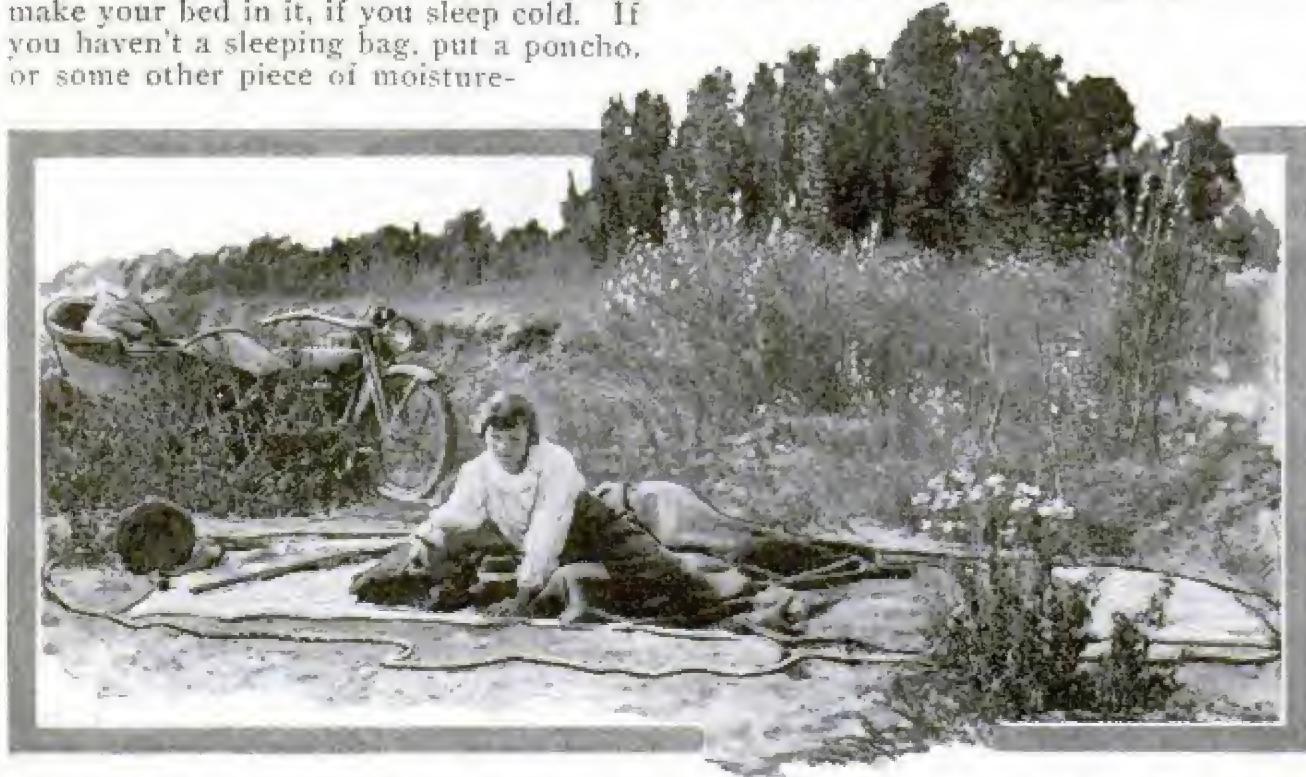
Always take more than one pair of boots or shoes on any camping trip. If you get wet feet, you'll be glad to have the extra pair. Changing shoes occasionally will also avoid sore feet.

Always cover yourself up with one more heavy blanket when sleeping in camp than you are in the habit of using at home, even if your home and camp-site temperatures are approximately the same. Add an extra army blanket for each 2,000 feet of higher elevation, or degree of more northerly latitude. Add one army blanket for seashore as compared with inland sites.

Three shots fired in succession, followed by a pause, and then two shots in succession, are recognized, or should be recognized, as a distress signal among all outdoor people.

Rub hot vinegar onto a sprained ankle, or on any part of the body where an ache or pain starts. This age-old remedy is known as "camper's liniment."

The camper who follows these few simple instructions will find the health and accident risks of camping far below those of civilization, and he will not only gain in health, but enjoy added recreation and comfort on any camping trip.



An Exploded Superstition, Still Believed by Many Campers, That a Horse-Hair Lariat Will Keep Out Rattlesnakes; Tests Show They Will Crawl over It as Readily as over Any Other Rope

WHAT WOMEN INVENTORS ARE DOING TO HELP YOU

Renee Stoeckle
4915 Bloomingdale Ave
Chicago

WINDETT-LADD
5025 SHERIDAN ROAD



Shoe Chest Keeps Pairs in Order and Dust-Free; This and Other Appliances Illustrated Here Were Shown at the Chicago Women's World's Fair



Mender That Fixes Runs in Stockings without Use of Thread, and Below, Improved Hook-Rug Machine; Design Is Traced on Burlap



Plug with Handle for Easy Insertion, and Safety Roller Attachment That Fits Any Clothes Wringer



A. S. Langford & Son
1126 S. Dearborn St.
Chicago

Mrs. Sammie Queen
Van Belt, 4829 Lincoln
Chicago

Whistette Handknit Co.
5025 Sheridan Road
Chicago

Aladdin Specialty Co. 565 S. Prairie ⁵⁷ Ave
Chicago; makers of Bear machine
and Co. Newark 3-8

FLYING DARK ROOMS TURN OUT PICTURES IN THE AIR



Preparing to Toss a Cylinder Overboard
and, Left, Removing Developed Negatives from Basket Dropped from Plane;
One Side of the Negative Is White So
Picture Can Be Seen without Printing



Torpedo Filled with
Flashlight Powder Attached to Plane and
Picture of City Taken
from Building Roof by Light of Flash Exploded from Speeding
Airplane



Night flashlight pictures developed in the air, flying dark rooms and cameras that shoot pictures 200 miles away, are the recent developments in the art of aerial photography. It is now possible to take a photograph of a region while speed-

ing above it and eight minutes later have a finished picture which the cameraman and his pilot can look at, or drop down to the staff headquarters on the ground, in case of military operations. This is accomplished through the development of a

special film and flying dark room installed in the front of the observer's seat. With his arms thrust through sleeves in a light-proof apron over the boxlike dark room, the cameraman swiftly immerses his exposed film in a thermos tank containing developer. After the proper interval, it is taken out and plunged in the fixing bath, and then into the bleaching and quick-drying solutions. Final drying is accomplished in a stream of air from the exhaust. The finished film is then pushed into a message basket, and when the airplane swoops near the ground, the basket is tossed out. When opened, the basket is found to contain a film, similar to negatives which the amateur photographer gets back along with his pictures when he has a roll film developed, with the exception that one side of the negative has a whitish appearance which makes it possible to see the picture on it without making a print. Everyone knows that, by holding an ordinary kodak negative up to the light, it is possible to get a general idea about the picture, but in order to get the detail, it is necessary to make a print on white paper. With this new film, a special process makes one side of the negative white and gives a pretty fair positive of the picture without printing. For reproduction purposes, prints can also be made from it just the same as from any other negative. Flashlight photography also is being developed. By dropping huge flashlight torpedoes from a plane it has been found that conditions similar to that of a clear sky at four o'clock on the shortest day of the year were obtained by the artificial light. Further developments in the art of aerial flashlight photography are expected to perfect a flash that will be so instantaneous in its operation that the eye will not register it. The third wonder in the catalog of the aerial photographer is a master camera for use in shooting pictures 200 miles away. A special lens and ray filters cut out the haze and make it possible to photograph objects beyond the range of the human eye. This camera must necessarily be used six or seven miles up, where frigid temperatures are encountered. To meet these adverse conditions the camera is equipped with heating devices that will keep the film emulsion in proper condition and prevent the hardening of the oil that lubricates the shutter and other movable parts.



Grandmaire Kralmar

Taking Exercise with Focusing Machine Which Develops Small Muscles of the Eyes

EXERCISER FOR EYE MUSCLES TO AID VISION

One of the latest instruments that scientists have devised to aid the eyes is an exerciser for the muscles used in achieving the proper focus. It consists, in part, of a series of prisms so arranged that when a person looks through them, rapid changes of focus are induced, thereby giving the muscles helpful exercise and strengthening them with reserve force. The apparatus is said to have proved beneficial in the treatment of eye disorders caused by weak muscles.

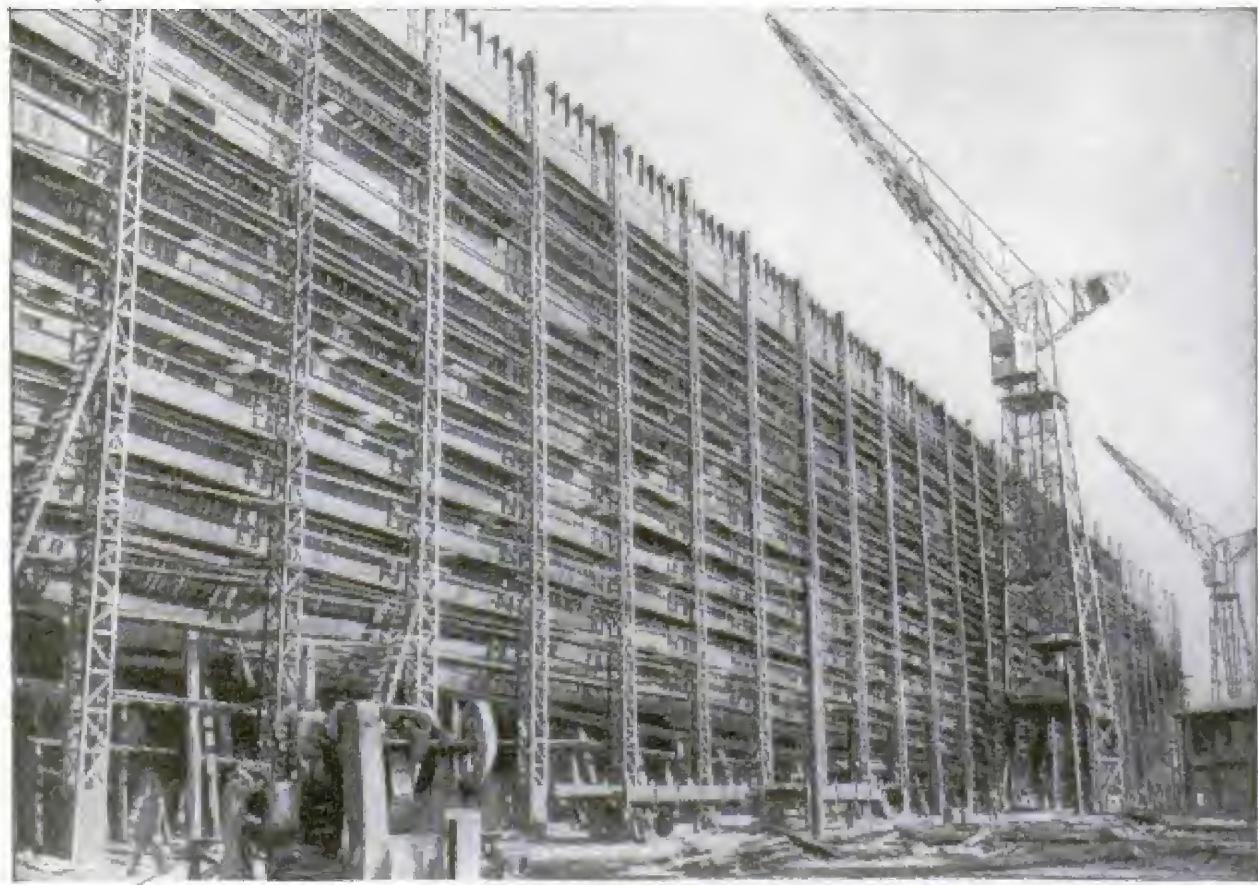
FLYWEIGHT AUTO FOR RACES 1570 TO TRY FOR RECORDS

Speed of 175 miles an hour is anticipated from a small racing automobile which has been built for British contests. It is in the "flyweight" class, weighing only 1,500 pounds and has been designed especially for races on the sands at Southport, England.



Getting Flyweight Auto Ready for Races

*Sunbeam Works
110 Wolverhampton.*



A Marvel of Beauty and Speed, a Giant Ocean Liner as It Looks While the Tailors of Steel Are Fitting the Steel Plates and Ribs into Place to Form the Perfect Hull

How Great Liners Are Tailor-Made

THERE is, apparently, little in common between the construction of an ocean liner and the making of a suit of clothes or a woman's dress. Few realize that patterns are as essential to the shipbuilder as to the tailor or dressmaker, and that all the parts of the hull of a steel vessel are first prepared, in full dimensions, in paper or wood.

Yet, just as it is necessary for the tailor or dressmaker to work with patterns if the parts of the garment are to form a whole that will present an attractive appearance and withstand wear and tear, so it is necessary for the shipbuilder to have a full-size pattern for every plate and shape that goes into the ship in order that the parts may fit together and form the vessel as conceived by the designer.

The construction of the liner "Malolo", designed by William Francis Gibbs, who reconditioned the "Leviathan" and was largely responsible for the design of the standardized troop ships built during the world war, offers a tangible illustration of the necessity of these patterns and the manner in which they are prepared.

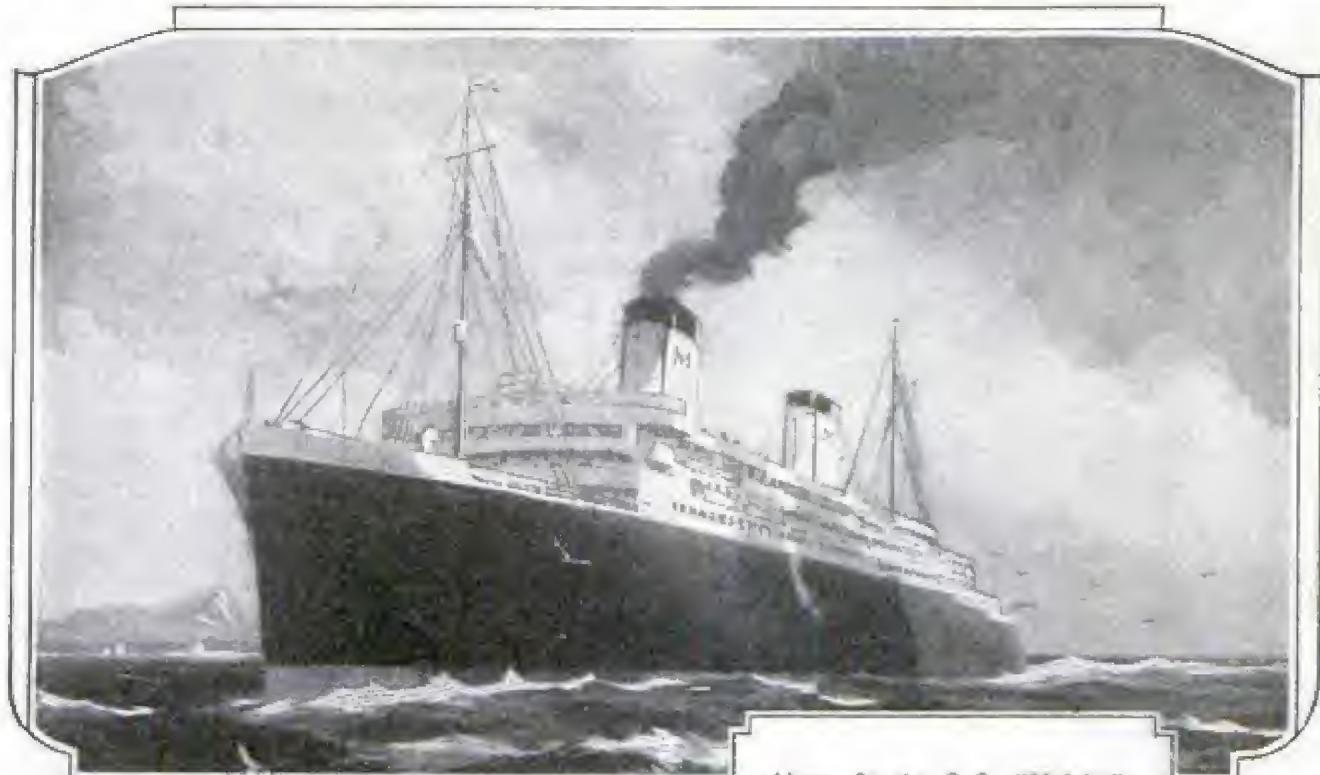
The vessel is now being built at Cramp's shipyard, Philadelphia, for the San Fran-

cisco-Honolulu run, and when completed, will be the largest and fastest high-powered passenger steamship ever built in the United States. Since the construction of the ship involves a number of unusual features, it is essential that great care be taken in the design of each and every plate and shape.

The patterns for the "Malolo" are prepared in what is known as the mold loft of the shipyard. This is an immense, well-lighted room with a wooden floor that is really a huge blackboard. The loftsmen, armed with pieces of chalk, wander over this blackboard, transferring to its surface the drawings of the ship prepared by the draftsmen. This time, however, the drawings are full-size.

Once the lines have been drawn upon the floor, the curves are taken by long, flexible wooden battens which are bent to the chalk outline to provide a wooden pattern, or template, for fashioning one of the ribs, beams, stern plates or other part of the vessel.

Each pattern receives an identification mark to indicate its position in the hull, and is then sent to the shop where it is copied in metal.

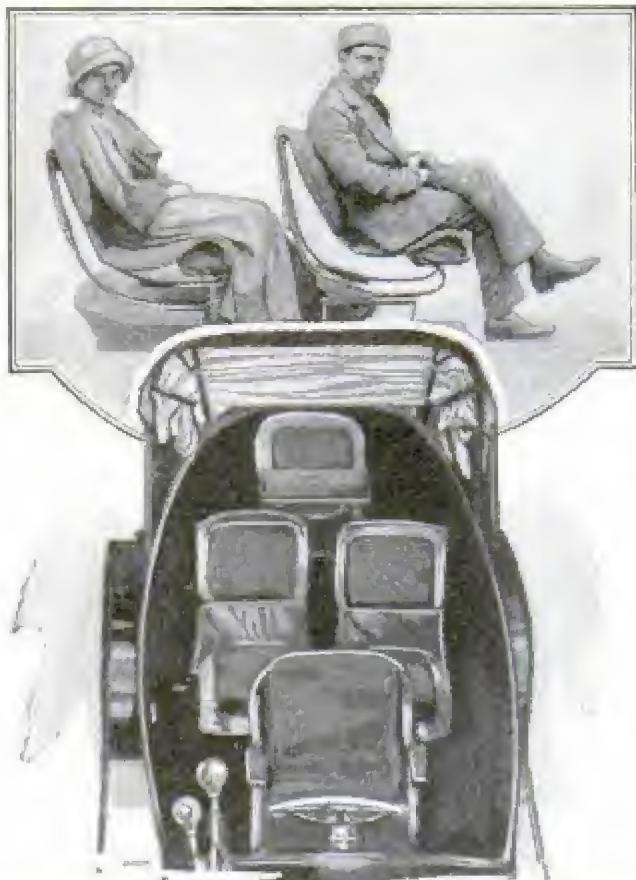


Above Is the S. S. "Malolo," the Largest and Fastest Passenger Vessel Ever Built in the United States, and Below, the Wooden Pattern for the Boss Framing of the Propeller Shaft



Here Are the Workmen Making the Wooden Pattern for the Main Deck of the "Malolo"; Every Part of a Ship Is First Laid Out on the Floor of the Pattern Loft





Side View of Seats, Showing Springs, and Arrangement inside Auto

**HAMMOCK SEATS FOR AUTOS
ADD SAFETY AND COMFORT**

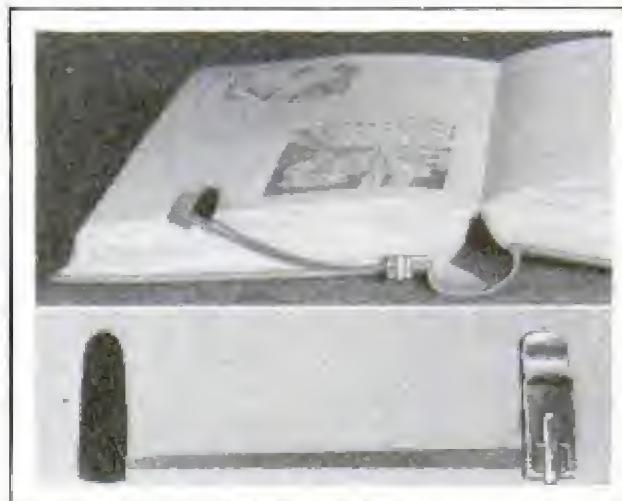
Automobile seats invented and patented in Germany permit the occupant to rest practically suspended on springs, which minimize all shocks and jars and reduce the likelihood of falling out in case of accident. They are shaped somewhat like rocking-chairs, the frame consisting of sheet metal bent to a curve and extending from the knees to the neck. A cloth strip is stretched over this frame and several spiral springs are arranged under the cushion below the knees. The seat necessitates no fixed position so that the body can be shifted easily and quickly, and is mounted on a kind of metal sled which may be attached to the floor of any car after the usual seats have been removed. The units can be placed two or three abreast or used as emergency seats in cars for six or more passengers.

**DOGS POSSESS PSYCHIC POWERS
ACCORDING TO OWNERS**

Why is it that a dog instinctively seems to understand the mood of its master? Why can they sometimes pick out the trail of their master's automobile and follow it? Because they possess psychic powers, in fact, are the most psychic creatures there are, according to Albert Payson Terhune, the writer, who has devoted several years to the raising of thoroughbred dogs. He gives specific instances in support of his opinion. On one occasion, while in New York, he suddenly decided to visit his kennels at Sunnybank, N. J. A few minutes later, his superintendent called him by telephone. "You're coming home today, aren't you?" the manager said. "Yes, but how did you know it?" Terhune replied. The superintendent explained that, five minutes before, "Wolff," one of the dogs, had come racing up to the house from the kennels, barking and leaping in a joyful manner. Mr. Terhune declares that this cannot be considered a mere coincidence as it has happened three times. Another dog that he had taken to a kennel at the home of a friend escaped and attempted to find its master by following the road they had taken by automobile in reaching the kennel. The way led to the Hudson river where Mr. Terhune's car had crossed over by ferry. Since the dog could not see to the other side, it apparently had managed to pick up the trail of the automobile, made twenty-four hours before.

**BOOKMARK KEEPS THE PLACE
AS PAGES ARE TURNED**

Being clamped to the binding, an automatic bookmark, introduced in Germany, falls into position as the pages are turned, so that, if the volume is suddenly closed at any time, the place is held without the need of special adjustment. The marker consists of a thin strip of spring steel on which is a small tab that slips past each page and holds those that have been turned from blowing or falling back.

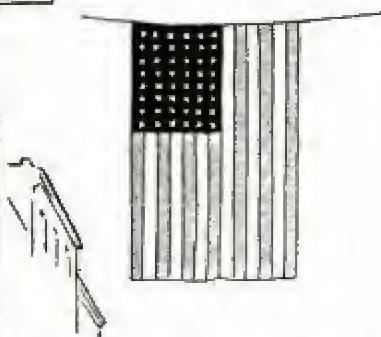


Bookmark in Place, Illustrating How Flap Keeps on Top of Page; Below, Marker Complete

cont Mr. Ed C. Magnus, Jagdweg,
Bonn, Germany

*Parade
Patriots and
Memorial Foundation*

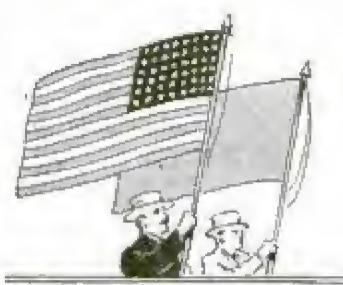
THE RIGHT WAY TO SHOW RESPECT FOR OLD GLORY



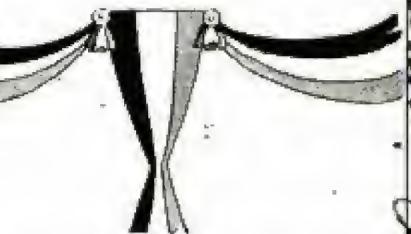
Hang the Stars to the North over East-and-West Streets; to the East, over North-and-South Streets



When Several National Flags Are Grouped from Staffs, the United States Emblem Should Be in the Center and Occupy a Position a Trifle Higher than the Rest; a Horizontal Position Is Preferred When Flag Is Displayed against a Wall; Stars Should Be to the Flag's Own Upper-Right Corner, the Viewer's Left



In a Procession with Other Flags, State or Foreign, the U. S. Flag Should Be at the Extreme Right of the Marching Column, or at the Front and Center of a Line of Flags



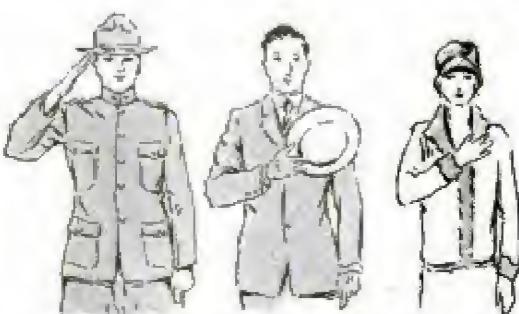
Use Bunting. Never the Flag, for Drapes, and the Bunting Should Be Hung with the Blue Strip Uppermost or to the Viewer's Left; the Reason for This Is That It Symbolizes the Union



When Flags of States or Cities, or Pennants of Societies, Are Flown from the Same Halyard, the U. S. Flag Must Be at the Top to Tip of Staff; When These Various Flags Are on Separate Ropes and Staffs, the U. S. Flag Must Be Hoisted First of All; the Chaplain's Flag or Any Other Flag Is Never to Be Placed above or to the Right of the U. S. Flag's Own Right



In Church, the Flag Should Be Displayed from a Staff Placed at the Clergyman's Right; on a Speaker's Rostrum, the Flag Should Be above and behind the Speaker's Desk; It Should Never Be Festooned over Doorways or Arches, Nor Fashioned into a Bowknot or Rosette



When Displayed with Another Flag, Ours Should Be on the Viewer's Left, and Its Staff in Front; These Regulations Were Prepared from the Adjutant General's Official Flag Circular by Dr. B. J. Cigrand, President of the American Flag Day Association

When the Flag Passes Unfurled in Parade, Soldiers and Sailors in Uniform Acknowledge It with the Regulation Military Salutes; Civilians Salute as Shown, Men and Boys Uncovering and Holding Hat in Right Hand Opposite Left Shoulder; Women and Girls Place Right Hand over Heart

This brochure may be obtained from American Legion Posts.

39 Charlotte St
Winnipeg, man. Canada

**VETERAN COAST GUARD CUTTER
1753 TO BE REPLACED BY NEW**

The coast-guard cutter "Bear," veteran of forty years' service in the Arctic, and one of the most famous wooden vessels afloat, is at last to be retired in favor of a modern steel ship, with the latest developments in oil engines



Commander J. F. Hottel with Model of the New Coast Guard Cutter "Bear," Now Being Built to Replace the Veteran Vessel

and electric drive. The successor, now building, is to receive the same name, in order to keep the "Bear" traditions alive. Built in England as a whaler, the old ship was well designed for bucking ice. Having been bought by the American government back in the seventies, to join the rescue fleet sent to the aid of the Greeley expedition, the "Bear" was soon transferred to the coast guard, and for forty years has made an annual trip from San Francisco into the Arctic and back again. In its long career it fought the seal poachers of the Pribilof islands, rescued the crews of scores of whalers which went down in the ice, and administered justice over a vast domain. The new "Bear," built of steel, is specially designed as an ice crusher. It will have an overall length of 216 feet. The steel shell will range from one to one and a quarter inches in thickness, so designed that it can bend and give before the ice and then spring back to place. Instead of the ancient 350-horsepower steam engine of the old "Bear" (which could lift its propeller clear of the water and

make ten knots under sail when winds were favorable), the new ship is to have two main engines of 600 horsepower, and three auxiliaries, two of ninety and one of twenty-four horsepower.

**PLAN BARRIER-REEF SURVEY
1758 FROM FLYING BOATS**

Six flying boats have been constructed in England for the proposed survey of the great barrier reef off the northeast coast of Australia. This huge formation has been built up

from tiny coral polyps until it now covers nearly 100,000 square miles, is 1,200 miles long and from ten to thirty miles from the coast. It acts as a huge breakwater and is most dangerous to shipping, although the channel between the land and the reef is safe, as are many of the smaller openings which give access to the coast. During the survey, some 200,000 pictures will be taken.

**FRUIT-PEST KILLER APPLIED
1756 BY MOTOR SPRAYER**

Spraying vines, trees and vegetables with different kinds of dust deadly to insect pests, has proved an effective way to improve crops, and to expedite the work and secure even distribution of the material, a motor-driven spreader has been devised. It consists chiefly of a small



Dusting Two Rows at Once with the Motor Powder Spreader; Nozzles Reach Upper and Lower Parts of Plants

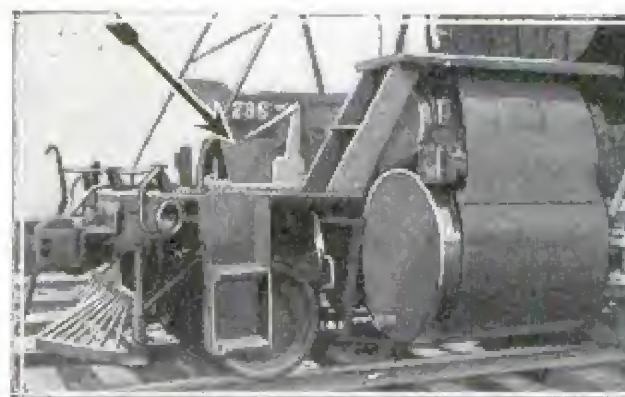
gasoline engine which drives an air current through nozzles aimed to direct the dust upon the growths to be treated. The material is supplied to the spreaders from a large hopper. The outfit can be driven between the rows of vineyards, orchards and other cultivations and reaches both sides of the row at one time. Special forms of the apparatus are devised for different kinds of crops, and attachments are also made for driving the blower directly from the engine of a tractor, eliminating the need of a separate engine.

Hordes of Long-Tailed Rats Defy Submarine Crew

Men aboard one of the largest of the United States submarines, schooled to battle dreadnaughts, found that they had a defiant and dangerous enemy close at hand when they returned from a South American cruise. The foes were huge, long-tailed rats. They proved too clever for traps and, multiplying in large numbers threatened to take possession of storerooms and other parts of the craft. Poison was out of the question because the animals would have secreted themselves in remote corners of the craft to die. Clubbing parties were finally organized. Members of the crew made daily sallies against the rodents, but at last reports had not entirely conquered them.

SILENT BRAKEMAN ON ENGINE AIDS RAILWAY SAFETY

Brakes are applied on the entire train the instant the engine leaves the rails, by a safety device invented by a fireman. It operates even if the pony truck drops from the rails. This is important, as the pony truck of a large engine may become derailed and the crew will not know it until frogs, switches or some solid object is struck, causing the entire engine to leave the track. The attachment is connected to the air-brake control in the locomotive. It is said to have worked without failing in numerous experimental tests, and has been installed on some of the heavier types of engines used on hauls across the Blue Ridge mountains.



Safety Device Applies Brakes Automatically if Front Truck Leaves Rails

third-class passengers, while liners are being fitted with added luxuries for those who prefer more elaborate surroundings while traveling.



© C. Rittenhouse, Jr.

Carrying Suitcase with Extra Handle That Fastens to Arm, Leaving Both Hands Free

EXTRA HANDLE FOR SUITCASE SIMPLIFIES CARRYING

Suitcases, golf bags and other luggage can be carried in such a way that both hands are left free by using an extra handle that fits on the arm. It keeps the piece from swinging and also elevates it high enough so that it is not likely to strike other persons or interfere in walking. It is especially adapted to light luggage and is quickly detached.

ATLANTIC TRAVEL LAST YEAR GREATEST SINCE WAR

During 1925, 732,151 persons crossed the Atlantic, an increase of nearly 147,000 over 1924. The bulk of this was represented by American tourists curious to see Europe. An interesting development in steamer accommodations is the increased facilities for persons of moderate means, many companies offering special inducements and conveniences for second and

Charles Rittenhouse Jr.
John G. Bawina Bldg.
Cincinnati, Ohio

Mr. Harley S. Johnson, Marine Journal 3/6/26
3/14 May St.

Vic Hansen, Wallace
66 d dabs.

POPULAR MECHANICS

Press Service

WRITING GUIDE FOR CHILDREN DEVELOPS PENMANSHIP

1922

Children and older persons, who do not know how to write, are taught the proper

Price 1.00



Learning How to Write with Aid of Metal Guide Attached to Edge of Tablet

arm and finger movements in forming the letters by means of indented aluminum guide strips attached to a writing tablet. They are printed with the alphabet, half on one side and half on the other, the characters being depressed so that they can be followed with the pencil for practice before attempting to produce the letter on paper. Three strips, one with capitals, the other with small letters and a third with the numerals, are included in one of the guide outfits with a convenient carrying case and a tablet.

TRICKS TRIED BY IMMIGRANTS TO ENTER UNITED STATES

185

Immigration inspectors are meeting some interesting and amusing situations as a result of the establishment of definite limits to the number of aliens who may enter this country yearly. Believing that negroes had a better chance to become citizens than other races, a large man from Bulgaria blackened his face with coal dust and attempted to "crash the gates." He had neglected to color his hands and neck, however, and was caught. Sent back, he marveled at the cleverness of the guards. Another declared that he was a veteran of the United States army. His proficiency in English gained him attention. "What war were you in?" the inspector asked. "I was with Washington at Valley Forge," the applicant replied, stating

further that he was well acquainted with the "father of his country" and knew how to drive an automobile well. A young man insisted that he should be admitted as he said he belonged to a privileged class and claimed a college professorship. Inquiry developed that he had been conducting a barber college.

TWENTY MILLION MOTOR CARS REGISTERED IN U. S.

1664

There is now one motor for every 5.8 persons in the United States, according to figures for 1925 from the bureau of public roads of the department of agriculture. Total registrations reported for the year were 19,954,347, which did not include 96,929 state and federal-owned motor vehicles. The increase in registrations during the year was 2,360,670 or 13.4 per cent. Florida reported a gain of 46.8 per cent, while Utah, Mississippi, Alabama, Arkansas, North Dakota and Texas each had increases of more than 20 per cent. New York has more automobiles than any other state, the total there being 1,625,583 in 1925. California, Ohio, Pennsylvania and Illinois follow in the order named. The total revenue from registration fees, permits, and the like, amounted to \$260,619,621, of which \$177,706,587 was made available for state highways.

LID OPENER FOR EGG CRATES PREVENTS SPLITTING

1519

Tops of egg crates are said to be removed without splitting and at a great saving in time with an opener now on the market. It is simply a thin piece of steel with a handle at one end. The bar is slipped under the lid, pressure exerted and the top comes off as a whole. The usual method generally causes a loss of three or four cents on each egg crate, or from \$12 to \$15 a car. One man can open 500 cases a day with the new implement, the makers assert.

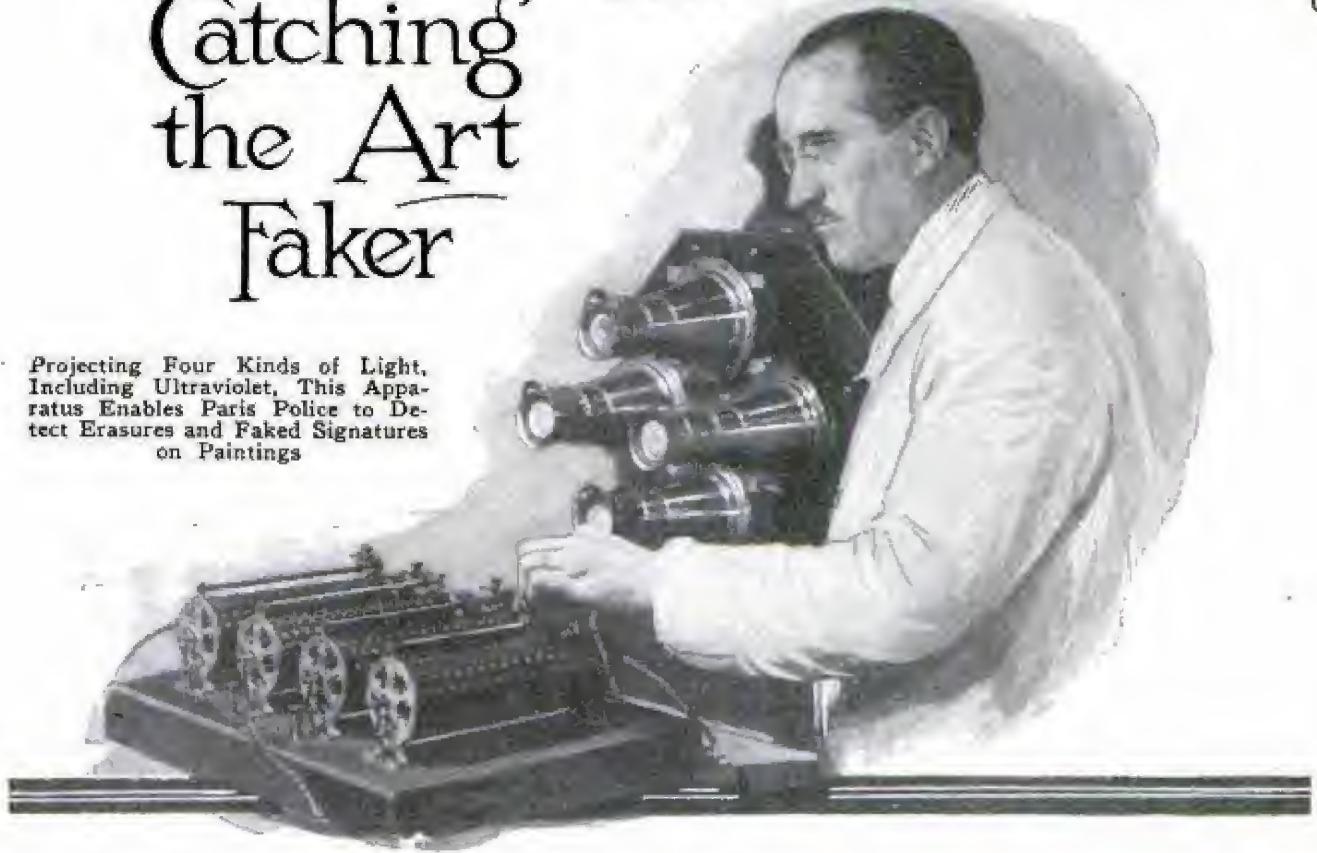


186

CA downpour of black rain that spotted white clothing on residents of Fresno, Calif., recently, was colored by particles of soot from an oil fire ninety miles away.

Catching the Art Faker

Projecting Four Kinds of Light, Including Ultraviolet, This Apparatus Enables Paris Police to Detect Erasures and Faked Signatures on Paintings



A SHORT time ago a French art dealer, who had spent most of a lifetime supplying works of art to museums and the homes of the rich, announced that a leading American museum housed at least \$600,000 worth of art fakes. Furthermore, he added, the Louvre national gallery of France, had been buying faked old masters for the past twenty years. And to prove the truth of his charges he declared that he knew they were fakes because he sold them to the two museums!

That famous museums and noted art critics have been misled by spurious art works since time immemorial is well known, but the engaging frankness of Jean Vigouroux in admitting that he

had supplied the forgeries to two big museums cast renewed light on the extent of the art-forgery business, and the methods undertaken to defeat it. The business, which centers in Paris and Italy, was interrupted during the war, but has since been revived on a bigger scale than ever. Anything that has value is faked, be it a painting, statue, stained glass, gold, silver, furniture, or what not.

To detect the fake is one of the hardest of tasks, but science is able to give some aid. The spectroscope shows the composition of the pigments in paint. If the materials used do not check with the formulas known to have been in use at the time the painter lived, then science is



Restoration Job on an Ancient Altar Piece; This Is Legitimate Work, but Restoration Sometimes Is a Disguise for Fraud



An Imitation of the Dutch School by an Italian Artist, Who Does His Work So Well He Could Fool Experts if He Desired

able to say at once that something is wrong. But the presence of modern paint does not always mean a fake, since practically every genuine old master has required considerable retouching to make it presentable. The real task is to determine whether there is an underlying basis of genuine old master, which has been subjected to modern restoration, or whether the entire work is modern.

The canvas likewise comes in for study. The material must be of the proper weave and material for the supposed date of use. But here again the wily faker may defeat the expert by buying some worthless daub executed at that period, painting over it an imitation after the manner of some famous master and affixing the latter's name. The expert then finds a canvas of the same period, an underlying layer of paint made from the proper pigments, and over it a painting which may be merely restoration, or a new job. Brush strokes, varnish, signature, and other details are scrutinized. Chemical and scientific tests

are made to determine whether an artificial aging material has been applied, or whether the effect is the natural patina gathered through the centuries.

A. B. Laurie, one of the first to use science in detecting painted frauds, determined by microscopic examination and photography the characteristic brush strokes and other details of genuine old masters, and compiled a mass of data which could be applied to future investigations. Faber, in Germany, Heilbronn, in Amsterdam, and Dr. Andre Cheron, the well-known French radiographer, used X-rays to trap the fakers. One of Heilbronn's first cases involved a famous picture of the Crucifixion, which had been donated to a leading art gallery. A figure of a kneeling nun was suspected of being modern work. Under the X-ray, the nun disappeared and in its place appeared a praying monk. The nun, it developed, was a portrait of the woman who had given the picture to the gallery.

Dr. Cheron, pursuing his X-ray studies, found how to determine the age of a picture. The old masters gave a much clearer X-ray picture than modern works, because the modern artist sizes his canvas with a paint containing white lead, and lead obstructs the rays. Modern restoration work shows up as spots in the X-ray photographs, and every bit of repair work is disclosed.

Sometimes even old fakes are discovered. A painting of the Dutch school, showing country folk dancing at a fair and playing music, was attributed to Adrian van Ostade. Under the X-ray all of the figures except one faint head dissolved, and in their places appeared a collection of peacocks and barn-yard poultry. Yet the country-fair picture was very old, for its pigments passed the rays readily.

M. Bayle, director of the identification bureau of the Paris police department, carried the work still farther. Noticing that photographic plates coated with gelatin bromide display varying degrees of sensitivity to different colors, he photographed a suspected picture under a strong light so that the characteristic brush strokes and the touch of the artist were clearly revealed. He built a special machine with four light sources, emitting converging rays. In the paths of three he



Faked Signature and Date Exposed by Ultraviolet Light; the Name "Goya, A." Faded Out and "Tirana" Took Its Place, and the Last Figure in "1799" Changed to "2"



Above Is the Faked Spanish Painting, Attributed to Goya, Which Had Deceived Many Experts Until It Was Placed under the Ultraviolet Rays



Above Is M. Cornillon, French Authority on Gothic Statuary, Whose Charges That the Louvre and an American Museum Contain Many Frauds Caused a Furor in the Art World; He Asserts That Alterations and Additions Made to Disguise Some Ancient but Worthless Piece as Something More Valuable Eventually Are Exposed by Color Differences



Two Chinese Porcelain Plates That Will Fool Anyone but an Expert; the Left One Is Genuine but That on the Right Is a Modern French Copy, Which Can Be Turned Out Cheaply

148

This Picture of the Good Samaritan, Valued at \$500,000, Apparently Executed in 1632, Was Picked Up by an Expert for a Song in an Australian Secondhand Store and Brought to America



placed red, blue, and green-colored screens, while the fourth provided pure white light. Rheostats controlling the power to the lights made it possible to darken three and increase the fourth at will, and under the varying lights different characteristics stood out. In the course of the trial of a case involving the authenticity of a picture attributed to Renoir, he was able, with his lights, to throw into relief the peculiar manner in which this artist used his brush, as a result of a stroke of paralysis.

Ultraviolet rays excite the fluorescence of certain mineral colors such as are used for modern fakes, so Bayle built an apparatus using a mercury-vapor lamp in a quartz globe, such as was described in Popular Mechanics recently for use in taking pictures in the dark, and by this means was able to expose faked signatures and other painted frauds. In one case, M. Bayle was called by a judge to determine whether the famous Spanish painter Goya actually drew a portrait thought by

experts to be the work of Tirana. He first photographed the disputed picture under the three colored lights, making it stand out in relief from the background, and showed up the retouching which had first excited comment. Under an X-ray examination of the head, he found a varnish containing white lead had been used. The ultraviolet light turned the signature "Goya. A. 1799" fluorescent, and beneath it could be read "Tirana, 1792."

Another French physicist, M. Paul Lambert, has developed an apparatus which enables the investigator to see an old and faded picture as fresh and bright as the day it left the artist's studio. Old paintings, when hung in galleries, often are practically invisible because the time-aged and cracked varnish reflects so much light the observer cannot see beyond it. Lambert employs an intense arc light, fitted with condenser and lens to give parallel light waves. He found that, if the reflected light from the varnish was polarized it became invisible. A prism made of Iceland feldspar, when rotated rapidly, has the property of polarizing such light, so the picture viewed through it appears bright and new in the intense light from the arc.

The advances of science, however, while they may save the individual from buying a faked old master, have not curbed the activity of the fakers. In the studios of Montmartre and the Montparnasse in Paris hundreds of painters are busy turning out the spurious work for the trade. Some work from carefully aged, but modern canvases, and others are painting over worthless but old works. They use science, too, applying the latest methods of fakery to meet the latest discoveries in the way of detection.

Not long ago one faker hired a lonely chateau with only one servant and proceeded to turn out twenty-five copies of genuine Corots, Daubignys and Rousseaus. With the background of the chateau, he had an ideal setting from which

to offer to sell his "family heirlooms" to unsuspecting buyers. Another faker turned out 100 copies in twelve months, working in secret at the same chateau.

The business of detecting fakes is enormously magnified by the fact that many of them were not originally intended to mislead. The fakers buy up the output of pupils of the old masters, not valuable in themselves, and by a bit of clever retouching and a forged signature, sell the works as genuine. Their task is made easy by the fact that the pupils invariably caught and used much of the technique of the teacher.

In Italy there is a legitimate and active trade in what is called "pasticcio," accurate and carefully aged copies of old masters. As painted, they give the poor man a chance to obtain, at small cost, a real copy, properly aged, of some famous painting, and when sold at a reasonable price as copies, the business is quite proper. But in the hands of the faker pasticcio quickly acquires a forged signature and an enormous price tag.

Faking of art works goes back at least as far as the early days of Rome, and perhaps much farther. When Rome grew

wealthy and began rifling the world for art works, the fakers got busy. It is recorded by one Roman historian that the emperor himself had a vast gallery full of fakes. Growing pressed for money he announced an auction, but, like the faker today, carefully concocted signatures and pedigrees for all his fakes. Suspecting that the shrewd citizens might still hang back, he invited a wealthy, but notoriously sleepy man, as special guest at the auction. Every time bidding lagged the auctioneer would look over, see the sleepy millionaire's head nodding, and knock down the sale to him. When the millionaire woke up he found he had bought \$400,000 worth of fake art while asleep!

Museums do not as a rule advertise the fact that they have been defrauded. Nevertheless the Louvre is on record as a frequent victim, as is the museum at South Kensington, England, while the number of American millionaires who have built marble palaces to house frauds is by no means small. Giovanni Bastianini, an Italian worker in terra-cotta, perpetrated some famous fakes in his day. He turned a bust of Savonarola in imitation of the work of Mino da Fiesole, which was so



An Artist Whose Work Has Been Imitated, Sometimes with Fraud in View; This Is Velázquez' Famous Painting "The Smithy of Vulcan," Which Hangs in the Prado Gallery in Madrid



Above Are Two Modern Forgeries, Made in London, the One a Creamware Bust of Washington and the Other a Peter Bates Loving Cup; in the Center Is the Spectrograph Which Analyzes Paints, and at the Right the Terra-Cotta Bust of Savonarola, Forged by Bastianini and Sold to the Victoria and Albert Museum as Genuine Quattrocento Work

good the Victoria and Albert museum at South Kensington bought it as genuine quattrocento work. Another of his busts, of a friend of Savonarola's, was one of the prize exhibits at the French world's fair in 1867, and was sold to the Louvre for \$3,000. The maker, incidentally, only got \$70 for the work, so even fakers aren't always highly paid.

One of the most amusing stories in the history of experts misled is that of a German professor who spent years traveling through darkest Africa making a wonderful collection of assegais, or native spears. He amassed scores of beautifully carved examples, with polished steel blades and extremely long and bulky handles, and eventually transported his collection to Europe to present it, with a monograph on the tribal carvings on the spear heads, to a German museum. At Rotterdam he unpacked the collection to show to a friend, and the friend discovered something that had been overlooked in the wilds of Africa—all the spears bore the small but distinct trade-mark of a Birmingham cutlery maker!

Faking is by no means confined to Europe. One of the oldest of fakes was invented by the New Mexico Indians who manufacture, bury, and then dig up "antique" pottery to sell to the tourists, while

Indian blankets and implements made in New England are on sale throughout the west. Picture faking is discouraged in American museums where old masters are on view for artists and students to copy. Most of the art galleries



do not permit a copy to be made in the exact size of the original, and before brush is put to the canvas, it must be stamped, in imperishable ink, to the effect that it is a copy.

The picture faker has held the stage because of the big demand for his wares, but there is really a larger business in faking statues. With modern power-driven carving tools, operated on the pantograph principle, the faker can produce an exact copy of the original, or as many exact copies as he desires. The expert's only hope of detecting the fraud, after the copy has been properly aged, depends on his eye for what he calls the "touch of the master." And it is hard to find two experts who agree on such intangible things as a master's touch.

4/18/20

POPULAR MECHANICS

near Casper, Wyo.

PLATINUM'S AID TO SCIENCE

INCREASES ITS VALUE 158

Not so many years ago platinum was only a curiosity to scientists. They didn't know what to do with it. Today, however, it is approximately six times as valuable as gold, the price rising from less than half that of gold in 1880 to \$120 an ounce. During the war, when there was a large demand for it in the making of high explosives, its price went up to \$150 an ounce. The metal's service in chemical and experimental laboratories as well as its employment in jewelry, is one of the reasons for its high market value. It will not melt even when heated to a temperature of 3,000 degrees Fahrenheit, resists almost every kind of acid, does not change in the air and is exceedingly malleable and ductile. Crucibles of it may be heated to incandescence while their contents are bubbling, but the metal itself will not melt. In the jewelry field, it has proved adaptable to working fine designs, because tiny strands of platinum will stand far more strain than gold. Plates of it as substitutes for parts of the human body are being used in surgery and it has been adapted to uses in the electrical industries. Some 300,000 ounces of the metal are required each year. A recent discovery of platinum deposits in Wyoming promises to affect this country, as at present less than a thousandth part of the amount used here annually is produced in the raw state in the United States.

1555

HAIR CLIPPER WITH VACUUM IMPROVES BARBER SERVICE

Provided with a vacuum attachment that removes the hair as fast as it is cut, a motor-driven clipper adds to the comfort of the customer and eliminates litter in the barber shop. As in the implement for cleaning, there is a bag in which the hair is collected until it can be emptied.

Persons who toe out when walking have to take from eighteen to twenty per cent more steps than those who walk straight.



As Fast as Hair Is Clipped, It Is Sucked by Vacuum into the Bag at Top

184373



Here's a Sign That Every Hunter Believes, a Bear-Trap Warning Set on an Alaskan Trail

SIGNBOARD NEAR BEAR TRAP PROTECTS HUNTERS

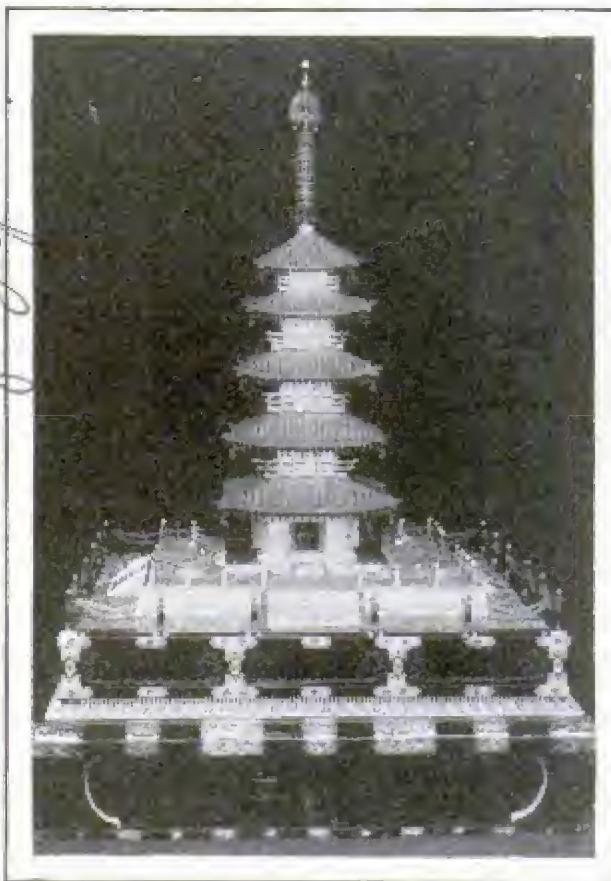
"Beware! A bear trap has been set near by." This warning is conveyed to the hunter or trapper by a homemade signboard which is often placed along a salmon stream in Alaska so that travelers will not step into the powerful steel jaws designed to hold the paws of a big bear. The average trap is so strong that it would be impossible for a lone hunter to extricate himself should he blindly step upon the trigger while following a trail through the woods. The traps are placed in ways the brown bears use in going to and from their feeding grounds. In the illustration, the big animals were frequenting a salmon stream to catch the fish and the trap was set in a trail leading to it.

W. E. Kuehne, 1306 Riggs
Residence, Austin, Texas

Bob Decker, Chicago Tribune, Chicago

PEARL AND PLATINUM TOWER
JAPAN'S GIFT TO U.S.

1797 Valued at nearly \$500,000, a model tower of pearls, platinum and other precious



Half-Million-Dollar Tower Model of Pearls and Platinum to Be Shown at Philadelphia Exposition

metals, made by Japanese craftsmen, is to be exhibited at the sesquicentennial exposition in Philadelphia and then given to the United States as a symbol of Nippon's friendship for this country. In all, more than eight and one-half pounds of pearls, natural and artificial, were used, and several hundred persons helped in the work which required five months to complete.

PLAN MEMORIAL TO INDIAN GIRL
GUIDE OF LEWIS AND CLARK

1837 In a bill recently introduced by Representative Winter of Wyoming, congress has been asked to provide a suitable monument for the grave of Sacajawea, the heroic, but little known Indian woman who guided Lewis and Clark on their expedition to the Pacific. Stolen from her native tribe, the Shoshones, when she was ten years old, she was carried away by a marauding band of savage Blackfeet Indians and later became the wife of Toussaint Charbonneau, a French trapper in a settlement near Bismarck, the present capital of North Dakota. There Lewis

Richard St. Kroy
1. arment

and Clark discovered her while they were seeking a guide and an interpreter for their undertaking. The explorers endeavored to obtain the services of Charbonneau, but at the last moment, he refused to go with the expedition. Capt. Clark had enlisted the sympathy of Sacajawea, who told her husband that she would kill herself and their child if he did not remain true to his promise. He was finally won over, but Sacajawea herself, with her papoose on her back, led the party through the territory of the Shoshones, down the Snake and Columbia rivers and to the sea, the "Everywhere-Salt Water" as the Indians called it. Aided by her memory of the country which she had traveled as a child, she guided the adventurers through the only feasible pass through the Bitter Root range, and but for her intervention, Lewis and Clark's band doubtless would have been killed by the Shoshones. On one occasion, she went ahead to meet a chief of the tribe whose members were waiting in ambush, believing that the Blackfeet were returning. Seeing him, she burst into tears for it was Cameahwait, her own brother. Again she prevailed upon Charbonneau to remain with the party when he threatened to desert the white men, insisting that he stand by his agreement until they had reached the ocean. She accompanied the travelers on the return trail. They left her at the Mandan villages, and there is no record that she received as much as a token of beads for her loyal services.

MAGNET AUTO-TROUBLE LIGHT
SIMPLIFIES REPAIRING

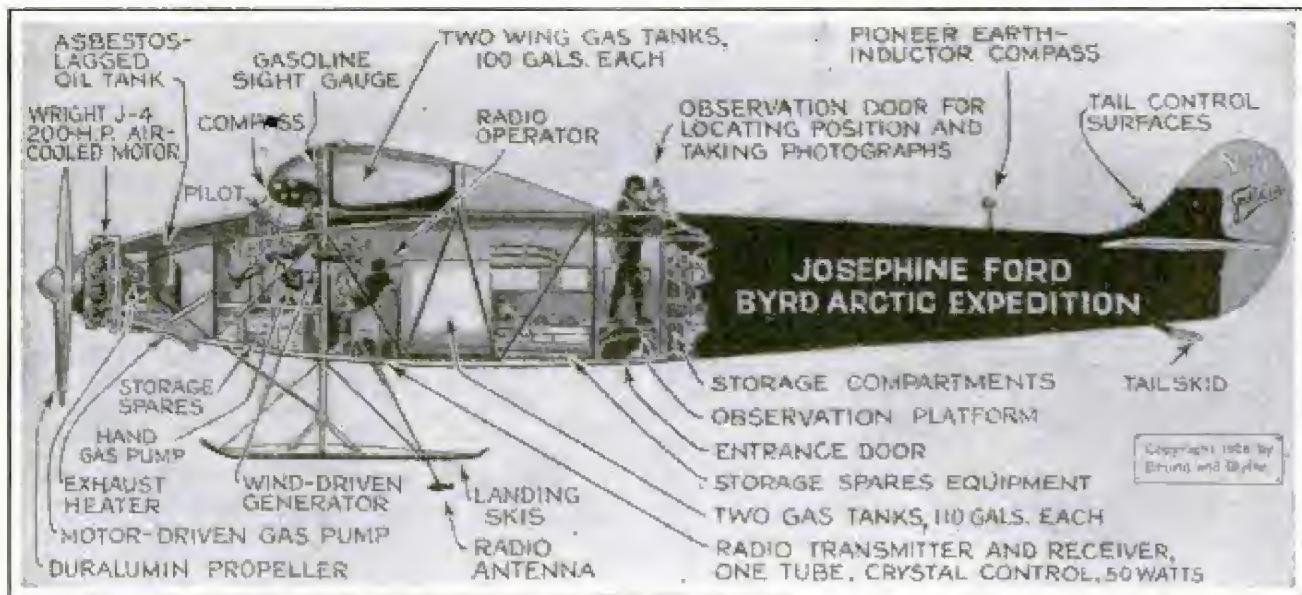
1517 *Price. \$1.50*

Equipped with an electromagnet of sufficient power to lift seven pounds, a handy trouble light can be placed on almost any metal part of the automobile without danger of falling off. The cord is plugged into any lamp socket on the car and is eleven feet long for reaching all parts. Less than one-half of an ampere is required to operate the magnet. The lamp is especially useful while taking metal parts out of the engine pan, or as an emergency tail or spotlight, and may also be employed for various tasks about the house.



Consolidated of sneakers
Corps 21 W Elm.

GIANT THREE-MOTOR PLANE FOR ARCTIC CONQUEST



Cross-Section Drawing of Three-Passenger Plane for Arctic Flight; One of the Most Important Instruments Is the Compass near the Tail; It Is Connected Electrically to Dial in Cockpit

Much of the interest in Lieut. Commander Richard E. Byrd's Arctic venture centers around the huge three-motor airplane provided for the expedition. The plane is forty-nine feet two inches long, stands twelve feet nine inches high, and has a wing spread of sixty-three feet three inches. One of the 200-horsepower motors is installed at the nose and the others on each side about halfway between the

nose and the cockpit. The fuel tanks have a combined capacity sufficient to provide gasoline for a cruising radius of 1,500 miles. At 100 miles an hour, the approximate cruising speed, the plane consumes twenty-eight gallons of gasoline an hour. There are generous storage spaces for food, instruments and guns, and the plane can be slowed down to forty-five miles an hour for landing.

1776
HUGE LAKE FOUND IN CANADA
WHERE MAP WAS BLANK

Maps of Canada indicate a large area of land southeast of the Great Slave lake but it has been found that another lake, 150 miles long and several miles wide occupies part of this region. The body of water was recently discovered by G. H. Blanchet, of the interior department of Canada, during a surveying trip on which he explored more than 60,000 square miles of this little known territory. The season's work entailed many hardships, long portages and, because of the difficulties of transportation, the party was forced to rely mainly on fish and game for food. The expedition revealed an excellent series of waterways as a means of entrance to a large expanse of virgin country.

which is believed to contain, among other resources, vast ore deposits, as rich samples of minerals are occasionally brought out by Indians who inhabit districts not yet explored by white men.

CAMPERS' FOLDING COOK STAND
ALSO SERVES AS TABLE



Stand Set Up and Being Packed in Carrier

To simplify the task of cooking over a bonfire, a collapsible metal stand for the utensils holds them securely near the blaze where they will receive the heat. When not in use, it can be slipped into a small box for easy carrying. It may also be adapted as a table to hold pots or skillets if an oil camp stove is employed.

The stand weighs but three and one-fourth pounds and the cooking space is 200 square inches.

Francis Dickie, Esq.

George C. Bauri, M.D.



Rex, "King of the Wild Horses," Surveys His Vast Domain from the Heights of Castle Rock, Wyo.; the Big Coal-Black Stallion Has Become Famous as the Hero of a Movie Play

With the Wild-Horse Hunters

By KATHLEEN CAESAR, *225 W. 40th St., New York* Herald Tribune

WHO will catch "Red Volcano," the capital prize among the wild horses of southern Utah?

For several years the question has been asked among wild-horse hunters and each year brings several volunteers, but no one has succeeded in outwitting the stallion that has been called the cleverest horse on the plains.

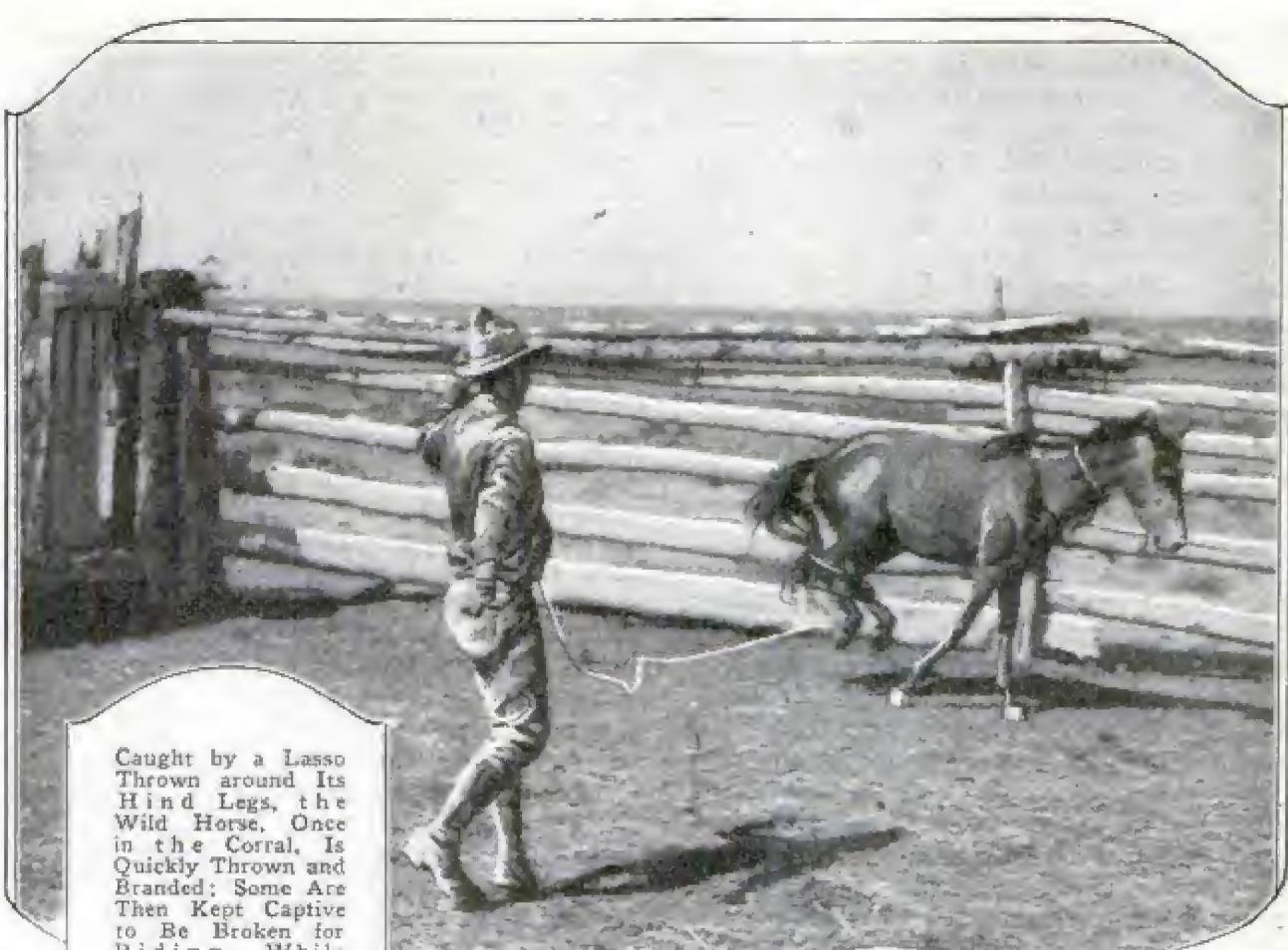
All the wiles of the horse hunter have been used against "Red Volcano." He has been hunted by relay riders, but outruns the swiftest horses that can be put on his trail. He has been trapped at water holes, but has leaped the highest corrals. And his trump card, when he finds that he is in danger of being run down, is to dash for a vast volcanic outpouring of lava, near Cedar Breaks. This deposit stretches for miles across the plateau. When the lava cooled, it formed knifelike ridges,

across which the ordinary saddle horse or pack animal can only pick its way slowly and painfully. But "Red Volcano" will dash at top speed across this desert. It would be certain death for mounted men to follow him at such a pace, and the wild horse, after thus shaking off his pursuers, returns to his haunts on the plains stretching toward the Grand canyon.

The case of "Red Volcano" is only one among many instances testifying to the cleverness of the wild horses, which have increased in numbers in the west until they are regarded as a menace to the interests of stockmen and farmers. It is estimated that upward of 1,000,000 wild horses are now roaming the western plains from the Canadian line to the Mexican border. Montana, according to the best statistics available, has 400,000 wild horses within its borders. Nevada and Utah have had



Relay Riders on the Final Lap, Preparing to Rope a Pair of Wild Horses Which Have Been Worn Down by Hours of Grueling Running from Successions of Cowboy Pursuers



Caught by a Lasso Thrown around Its Hind Legs, the Wild Horse, Once in the Corral, Is Quickly Thrown and Branded: Some Are Then Kept Captive to Be Broken for Riding, While Others, with Their Owner's Mark in Place, Are Turned Out Again

Roping the Desired Horse Out of a Band of Kicking, Frightened and Vicious Wild Animals Is No Mean Feat, for Often the Desperate Prisoners, Seeking Escape, Will Turn on Their Captors



wild horses since pioneer days, and they survive by thousands in spite of being trapped by hunters and shot by sheepmen.

The people in other sections of the country, who cannot realize why wild horses should be a nuisance and why, in this great west of ours, there is not space enough to preserve them as a romantic feature, fail to understand that, for some years now, the west has not been a wild and woolly place, but a settled and industrious section of the country. Stock raising is one of the chief industries and the open range is one of the main sources of food for the live stock. The wild horses in Montana alone eat enough range grass in a year to feed 1,000,000 head of sheep or 500,000 head of cattle, to say nothing of the damage they do running over cultivated ranches. So the war that has been declared on the wild horse is largely economic.

On the other side we have those who justly insist that the wild horse like the buffalo is a part of the picturesque west, and should not be exterminated. The cowboys who hunt wild horses are mostly in the game for the love of the sport. They admire these animals for their sagacity and fleetness and are bitter against the sheepmen who shoot the wild horses at the water holes. The slaughter of wild horses and canning of horse meat, for human consumption abroad, in particular have roused the ire of western cowpunchers. Their attitude was shown in the case of a suspect who was charged with attempting to dynamite a horse-meat canning plant. He pleaded guilty and for justification said, "I couldn't help it. I am a cowboy and I love horses. I can't bear to think of people eating them."

Wild-horse hunting used to be profitable. At the outbreak of the world war, wild horses were sold at from \$30 to \$40 a head. The price has fallen off steadily until now they are hardly worth rounding up. The Indian bureau recently received a bid of from 50 to 75 cents a head for the wild horses on a reservation. Even this was not carried out, as the bidders found that the expense of the roundup precluded any profit.

The Indian reservations are generally overrun with wild horses. How to dispose of these animals is a problem which the bureau at Washington has not yet solved. Frequent complaints are received from leasers and from white settlers on or adjoining the reservations. Recently, while the writer was sitting in the office of the Indian commissioner, an official from a Montana reservation came in to talk over the problem. Under the new law, horses can be disposed of within ten days after notifying the owners.

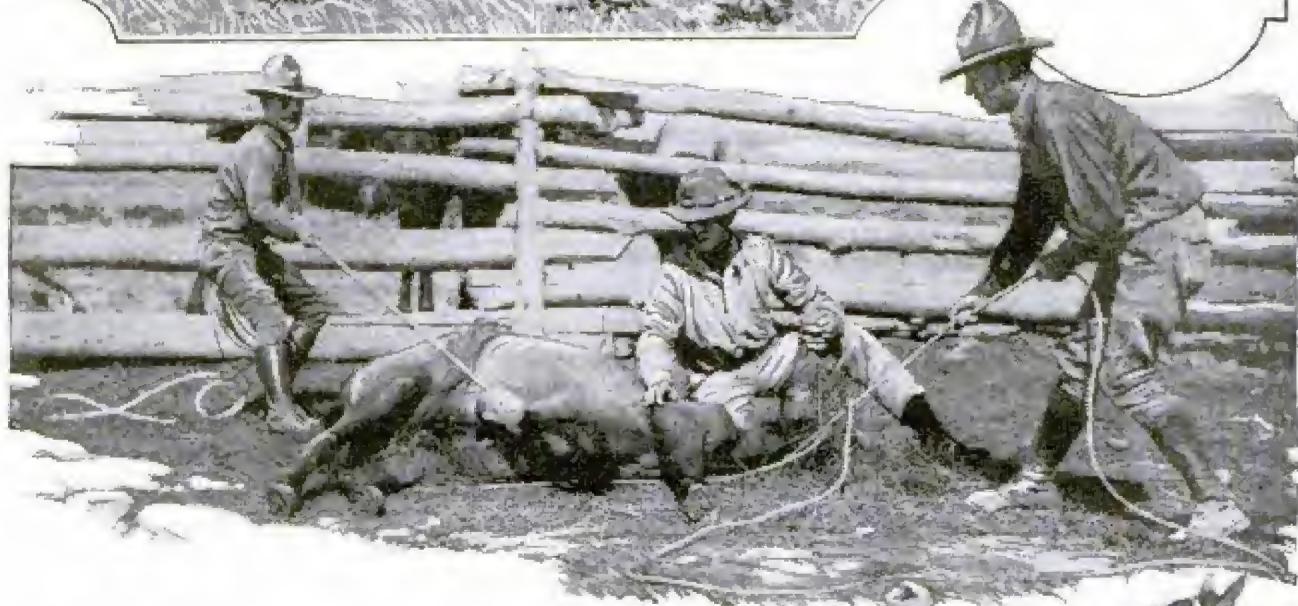
As horses often travel great distances, settlers complain that this does not give them sufficient time to reclaim their strays that may have joined wild herds. Under the old law, thirty days was allowed for reclaiming animals. Thousands of so-called wild horses in many states are domestic animals that have been abandoned by their owners or coaxed away by wild stallions. Even when these horses are rounded up and returned to their owners, they soon rejoin the wild-horse bands. They may be found again, in a few days, many miles from the home ranches. The problem is particularly acute on and adjoining the Indian reservations in New Mexico and Arizona as well as in the northwest.



Bringing in a Band of Captives; Each Wild Horse Is Hobbled and Tied to a Well-Broken Work Animal, to Prevent a Successful Break for the Freedom of the Open Range



A Pair of Typical Wild-Horse Hunters of Southern Utah, Who Pit Their Skill and Determination against the Craft of the Willy Stallions Which Lead Their Bands into the Mountain Fastnesses



Throwing a Wild Horse Preparatory to Hobbling It, and Below, a Relay Rider Poised, Ready to Take Up the Chase When His Mate's Mount Gives Out in the Race with the Wild Band

The genuine wild horse is a descendant of the first horses brought into this country by Coronado, Escalante and other Spanish explorers in the sixteenth and seventeenth centuries. Lieut. Zebulon M. Pike, in the records of his expedition up the Arkansas river, in 1806, across what is now Oklahoma, Kansas and Colorado, tells of seeing great bands of wild horses all along the trail. The pioneers had trouble with them, as they would come into camp and coax away domestic animals. The early-day hunters were called "mustangers." Roping was their principal method of hunting. Occasionally, when they had chased a good horse without avail, they would resort to "creasing," a tricky method of shooting so that the bullet would strike the animal on top of the neck just in front of the withers and



an inch or two deep, close to the spinal column. This temporarily paralyzed the animal, and the hunter would then tie his front feet and halter him to an ox or a

steady-going farm horse—a method still used in subduing captured animals. Creasing is seldom done, because of the large number of horses killed.

The hunters today resort chiefly to the trapping method. Corrals are built around water holes, and thus the animals are caught when they are forced to come in for a drink. In this way it is not unusual to catch an entire band at one time. The bands seldom run over thirty, whereas in earlier days they counted as high as sixty or seventy.

A Nevada horse hunter recently nearly lost his life in attempting to trap a particularly valuable band. A corral had been built at a water hole. For three or four days the horse hunters lay in wait. At last the band, headed by a beautiful stallion entered the corral. One of the hunters came from hiding and was putting up the bars when the horses rushed in a body at the gate. They crashed through, and the man went down under the brush and heavy bars. Horses will seldom step on anything on the ground if they can jump over it, and to the amazement of the other hunters, they found their companion alive, although the entire band had passed over him in the wild rush.

The real thrill of adventure in wild-horse hunting is running them down in the open. This can only be done by relays of riders. Saddles are discarded and the riding is done bareback, with only a surcingle to furnish a hold. This is done not only to eliminate weight but to save the rider in case of a fall, as it enables him to roll free from the horse. Even with

these precautions, many riders are hurt, for the wild horses are followed at break-neck speed across the rough country. The greatest danger is from badger holes, into which the horses often step and break their legs.

For several years the Indian horse hunters in the vicinity of Ft. Belknap, Mont., have been trying to capture a beautiful stallion which has led away many domestic animals.

"Finally we thought we had the stallion trapped," said one of the horse hunters. "We had driven him into a canyon, across the mouth of which we were prepared to stretch a wire fence. We had no sooner got the fence in position than the horse came dashing down the canyon. We thought that no horse could jump the fence, but the stallion cleared it easily. Then he swam a river and disappeared on the other side. This stallion is constantly on the lookout. He climbs all the high hills and watches for signs of danger. He makes a pretty sight, outlined against the sky, and is worth a good deal of money to anybody who catches him, but no one has turned the trick yet."

The domestic animals which join the wild-horse bands soon become uncannily clever in eluding pursuit. They learn all the hiding places and are as difficult to trap as horses that have never been branded. They may be very gentle and docile in captivity, but when once they have tasted the delights of freedom, all their old instincts return. Similarly, wild horses that have been captured and tamed generally escape to their old life.



Milling Round and Round in the Corral, the Captives Try to Avoid the Cowboys' Lariats by Keeping Continually on the Move, Crowding as Far as Possible Away from Their Captors

Contract
with Ralph Modjeski

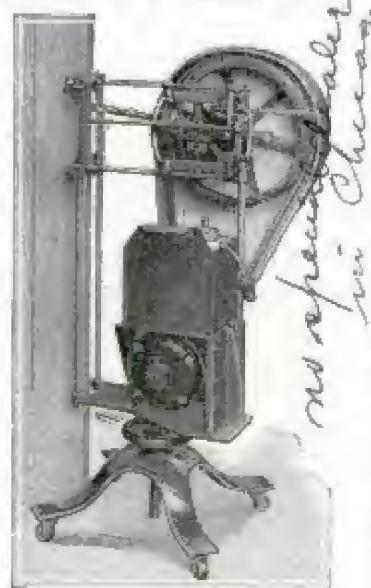
1946

FIFTEEN - MILLION
RIVER BRIDGE ¹⁵⁹⁰
AT NEW ORLEANS

Fulfillment of a dream of more than 100 years is seen as a result of contracts recently signed for the construction of a bridge over the Mississippi at New Orleans. With its approaches, it will be three and one-half miles long, the bridge proper 2,600 feet, one cantilever span, 750 feet, and the structure will rest on piers 112 feet above the water, to permit the passage of large vessels beneath. Difficulties are expected because of the condition of the land. In laying the foundations, forty or fifty feet of water and an undetermined depth of river silt must be penetrated, while some of the ground on which the approaches are to be built is lower than the surface of the river yet will have to be constructed so that railroad trains will not encounter too steep a grade. It is estimated that the bridge will cost \$15,000,000.

Christian Science Monitor
3/3/26
MORTISER DRIVEN BY MOTOR
ELIMINATES HAMMER ¹⁶¹⁶

Operated by an electric motor, a mortiser that cuts any kind of wood is said to do the work five times faster than is possible with hammer and chisel. It can be clamped to the unit in which the mortise is to be cut, is mounted on a rolling base for easy moving, and can be raised or lowered as desired. There is a depth gauge which automatically stops the machine when the blade has entered to the desired depth, and slots up to six and one-fourth inches deep can be cut, the necessary adjustments being made quickly.



Using a Fireman's Smoke Helmet in Place of the Regular Suit, Diver Can Remain under Water Twenty Minutes

SMOKE HELMETS FOR DIVERS
REPLACE HEAVY SUITS

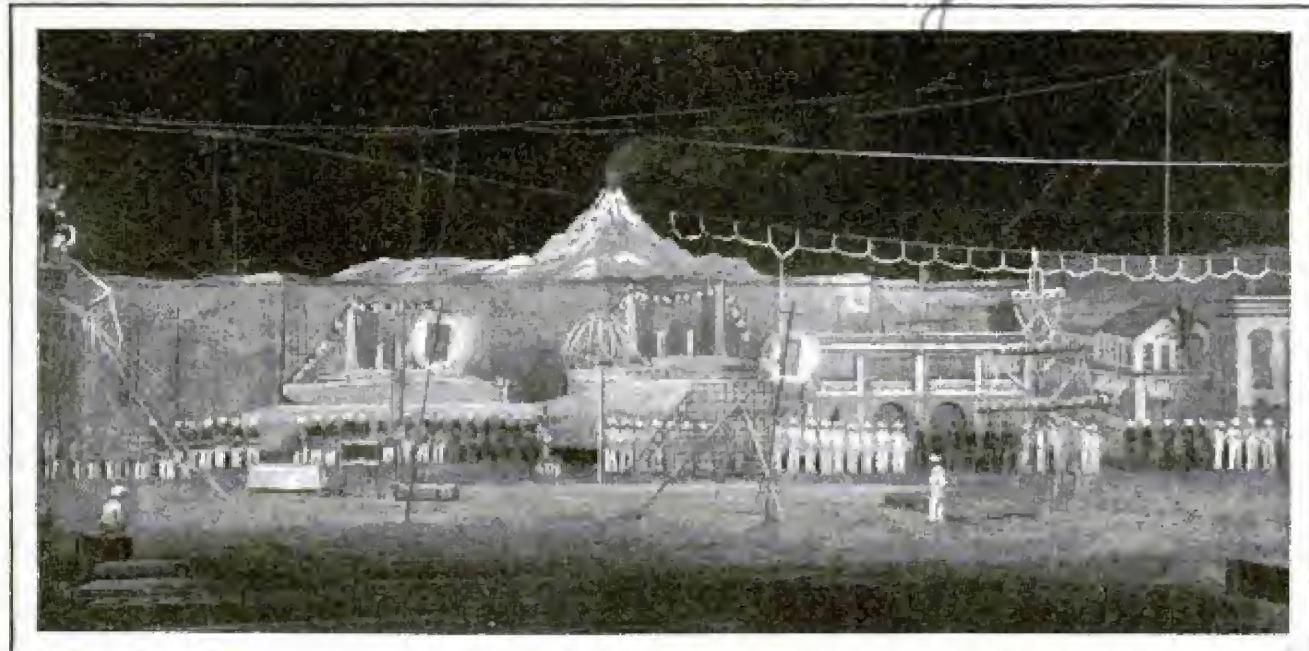
Helmets designed especially for fire fighters have been found useful for divers in shallow water, serving as well as the heavy suit for limited depths, according to reports from Portland, Ore. Equipped with them, men remained under water for twenty minutes without feeling any ill effects, the oxygen tanks and valves in the helmets being as impervious to water as to smoke. One advantage of this helmet is that it can be quickly adjusted in case of emergency. It is proposed to have members of city fire departments drill in the use of the helmets as diving apparatus for rescue work.

WAR WAGED ON RABBIT PEST
BY BOUNTY AND DRIVES ¹⁵⁶⁵

Roused by the annual crop losses of millions of dollars caused by rabbits, the Colorado legislature has permitted county commissioners to offer a bounty for each one killed. Boys earn pocket money in this way, getting a cent and sometimes more for each pair of ears. But the most successful method for combating the pest is through community drives. As many as 1,000 persons join in, herd the rabbits into V-shaped woven-wire traps and kill them with clubs. Last winter 500,000 were dispatched in this way.

Chicago Evening Post
3/11/26

Adapted by Capt. John P. Greene
Bureau



Just Before Elaborate Fireworks Set Was Touched Off; Loops at Right Produce Effect of Flaming Waterfall; Actors in Position for Their Parts in the Spectacular Play

Staging Plays in Fireworks

Unseen "Actors" Take Leads in Blazing Dramas under Skilled Showmen in Sparks

By PAUL PADDOCK

IT had been a scorching day, but the tired crowds at the county fair had stayed late and packed the big grandstand to capacity to see the fireworks display, scenes from the life of Christ. The program promised a bewilderingly beautiful climax. It came unexpectedly with a fizz and a sputter, but was greeted with laughter instead of the gasps of awe and admiration the management had expected. By mistake, the man who was setting the pieces off had touched the wrong fuse. The "Ascension" was fired first!

But such mistakes are rare, according to James Cunliffe, about as infrequent as an injury to the men although they handle thousands of pounds of highly explosive fireworks each week and walk in the thick of it when the big pieces are in action.

Mr. Cunliffe makes a business of supervising the presentation of gigantic spectacles in fireworks. He has spent a large part of his time for the last forty years erecting complicated sets and firing them off. He has literally burned up fortunes and has been paid for doing it. There are probably not more than a hundred experts in this highly technical and exacting form of show production in the United States. They must have a keen sense of the theatrical, skill as carpenters and mechanics,

knowledge of handling all sorts of fireworks and must be resourceful at all times, for winds, rains and the spectators themselves sometimes work havoc with costly displays. But for the prompt action of an attendant recently, there would have been a serious accident at a county fair. An inquisitive farmer, strolling about where a set was being erected, lighted his pipe and tossed the match in the grass. A second later the flames would have reached the fuse of a gigantic fan replica filled with several hundred pounds of powder, shooting stars and rockets. Wind causes no end of trouble, for when it shifts, it may blow the smoke between the pieces and the audience and the sets, shutting off the spectacle. Shellac forms a part protection against rain, but when a soaking shower descends, the men try to be philosophical and get ready to tear down the soggy works for fresh ones. Most large companies carry rain insurance to cover part of the loss in such cases.

Four or five men are often detailed to ignite the fuses of the big pieces. Some of these displays require the burning of as much as \$1,500 worth of fireworks in a single evening. It is now possible to represent the burning of Rome, volcanic disasters, such as the "Last Days of Pompeii,"



Where Drama Is Staged behind "Footlights" That Travel Skyward; Trained Crews Are Required to Fire Pieces That the Climax May Be Reached at the Right Time

regarded as the "Uncle Tom's Cabin" among pyrotechnic displays, battle scenes, and practically any kind of a tableau or design. Colored fire can be manufactured in scores of shades. Bright blue is the rarest, for it is the most expensive. Ways have been developed for regulating the speed at which the fuses burn so that parts of the set are fired in the proper sequence. One of the lances, the technical name for big sets, may contain as much as a mile of fuse. After it is erected, about all that the fireworks man has to consider is the projecting part of the fuse, the "match" as it is called. It is part of his job to find that among the smoke and glare and to touch it off at exactly the right time.

Mr. Cunliffe explained that elaborate measures are now taken to protect the fireworks men. In handling mortars, for instance, heavy barricades are erected so that in case the bomb, which is to be shot high in the air and exploded, should go off prematurely, the force of the detonation would be broken by the obstruction. The lighters carry what are called port fires, a small flame at the



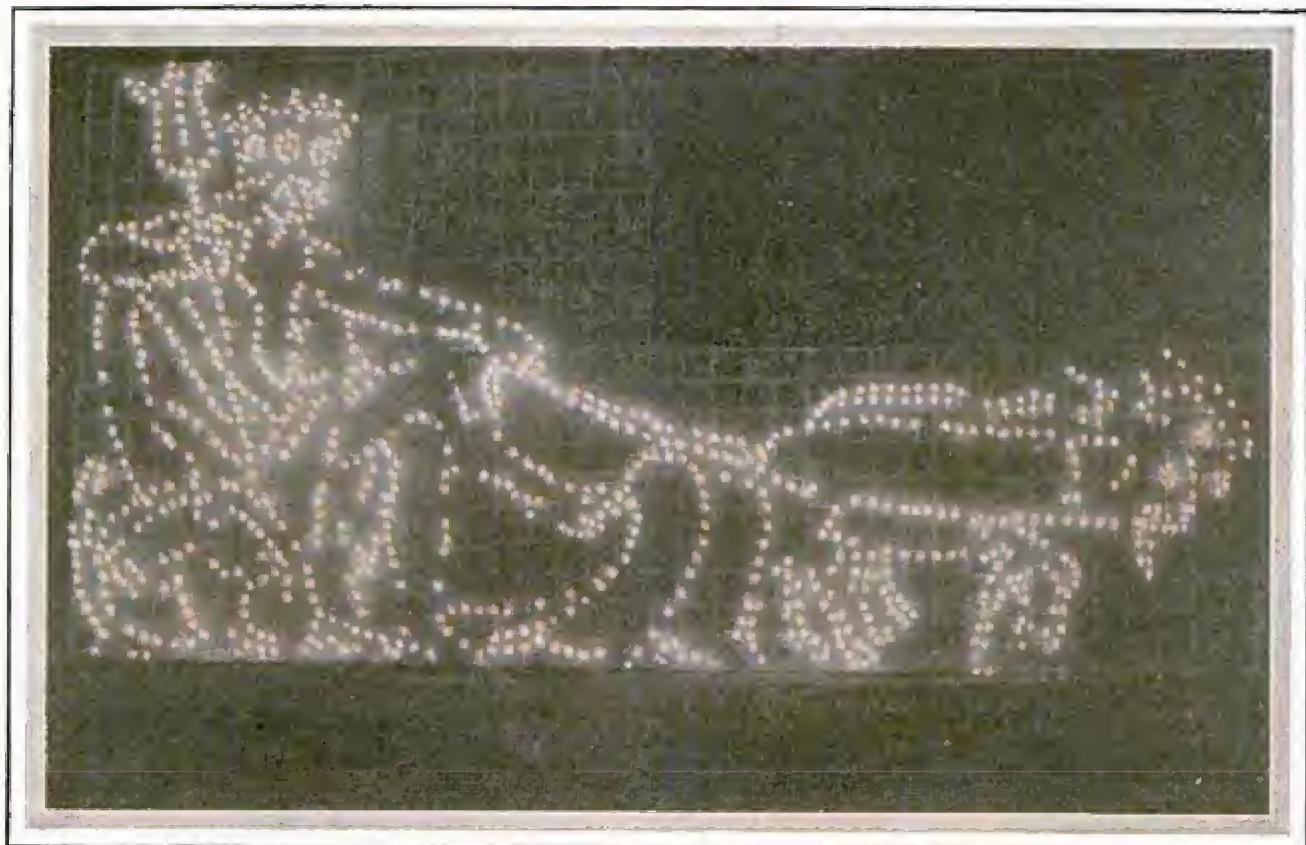
Preparing a Comic Set; an Aerial Bouquet of Colored Flames, and the Use of Fireworks for a Fete in India



mon commercial grade of fireworks, Mr. Cunliffe said. Chemicals are mixed in stronger proportions and fuses are made to burn faster. These factors add to the hazard of the work, while the mere quantity of explosives near which the lighter must walk in semidarkness or thick smoke presents a risk. In some assemblies, there are 150 pounds of powder to every fifty square feet of set.

When a large piece is ordered for display, twenty-five or thirty men will be sent with it to help unload the car, erect the frames on which the "gerbs," the flowerpot blazers and other stationary units, and the "turners," the pinwheels and similar pieces, are to be placed. The design has first been carefully worked out on paper,

end of a special carrier or on a Roman-candle stick, so that their hands and faces are not exposed unnecessarily. Powder used in the exhibition pieces is much more explosive than that in the ordinary firecrackers and candles purchased for your Fourth of July celebration, the com-



Photos Courtesy Theatre-Duffield

A Glowing Neptune in His Chariot Performs before the Curtain of the Night; Sets Like This Contain a Mile or So of Fuse and Many Pounds of Powder

ruled in squares to represent the cross-pieces of the frame and is then transferred to the actual assembly that is to be fired. The lines of the design are traced in flexible rattan. This, like the frame itself, is intended to last as long as the piece is displayed. The units of the work are then attached to this rattan and the fuses of the different parts connected. The fireworks are shipped in bulk, disconnected, and are not joined until actually on the frame, ready for igniting.

Like the human performers, fireworks get a rehearsal but not on the evening before the show actually opens. It is generally done weeks before near the factory, usually on the outskirts of cities where the dangers of explosions will be minimized. A framework is erected, the piece attached according to the directions, which up to this time have been worked out only on paper, and the set is fired while a few critical experts note the general effect, action of the fuses and other details. If the piece passes these exacting gentlemen, it is prepared for general production. Failures on location, that is, when the set is actually to be displayed, are almost unknown, for practically every chance of blunder has been eliminated by careful construction and inspection.

On a big set, prompting the "powder actors" with port fires, the showmen in

sparks, like their theater brethren, are under a director who gives signals, by whistle or other means, when various pieces are to be fired, so that the display will fit in with the rest of the program. In the big spectacles, hundreds of human actors are employed and the effect of their efforts will be largely lost if the fireworks do not go off at the correct moment. Comedy, too, is achieved in this branch of showmanship. From an innocent-looking glow at one side of the set, thunders a tremendous crash as a bomb explodes. A similar glow is seen at the other side of the set and the audience braces itself for another bomb, but a feeble squib sputters and the pyrotechnist has achieved that coveted tribute, a laugh. Comic cartoons and moving comedy pictures are now produced in fireworks.

Keeping the fireworks fresh, dry and always protected from sparks is an important part of the game and may mean the loss or profit of a whole tour. Chemicals in some of the works deteriorate, or the little steel filings in the rockets get rusty and will not glow so brightly.

Fireworks in one form or another are now used in practically every part of the globe. Last season, one company was showing a spectacle simultaneously in twenty-nine cities in this country; a large order was recently received from an or-

ganization in Egypt, and shipments have been made to lonely ocean islands and cities in India. Patriotic ideas are best suited to presentation in fireworks, the showmen have found.

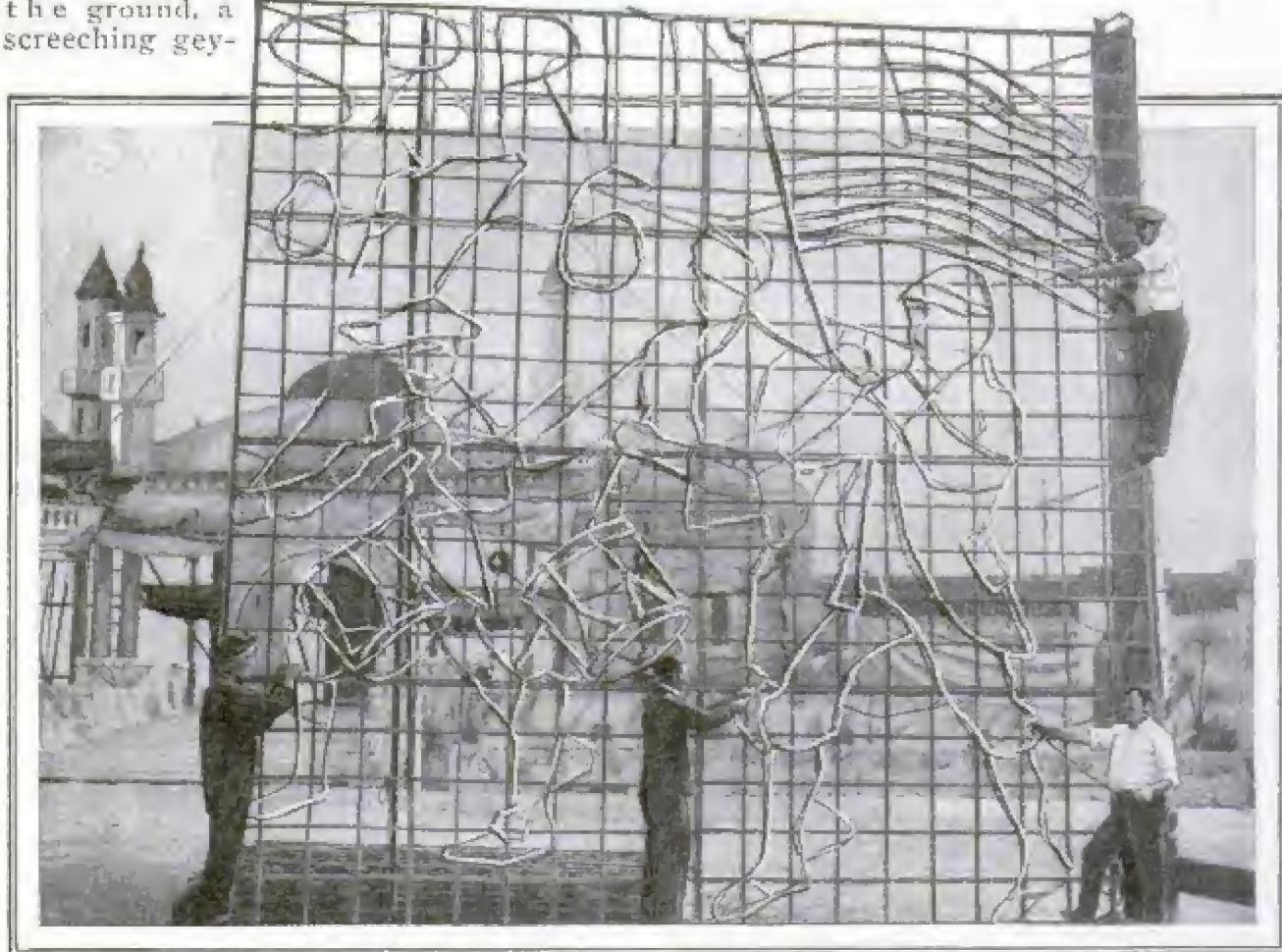
For the sesquicentennial exposition in Philadelphia this year, scenes from the days of 1776 are to be enacted in pageant and fireworks before a curtain 500 feet long and from twenty to fifty feet high. The nightly display will require 300 actors in costume, thirty fireworks operators to manage the ton or so of explosives that will be fired at each performance, three electricians to handle the lighting effects, ten wardrobe attendants and three directors. Sets depicting the Liberty Bell, an action fireworks picture of the battle between the "Bonhomme Richard" and the "Serapis," Betsy Ross and "Uncle Sam's 150th Birthday Cake" are a few of the pyrotechnic tableaus that will accompany the spectacle.

The public is demanding more noise with the fireworks displays, the producers have found. To satisfy the patrons, rockets are now being manufactured that, in bursting, release thousands of glowing whistles which emit shrill notes almost until they reach the ground, a screeching gey-

ser that projects steamlike material fifty or sixty feet in the air, and loop aerials like those of the radio. Realistic imitations of static whistling are produced when the piece is lighted. The trouble gets worse and finally the entire set explodes with a tremendous crash and a shower of sparks.

ORIGIN OF STREAMLINE DESIGN 1446 TRACED TO FISH

Streamline forms, now widely used by designers of submarines, automobiles and aircraft to decrease wind resistance, had their beginning in the natural shape of fish, according to Prof. Edward W. Berry of Johns Hopkins university. He believes further, that flowing water alone did not produce this body shape in fish, for the same results are obtained by a moving fish in stationary water as by moving water flowing over a stationary fish. The form, the professor holds, represents a natural adaptation to conditions. That the shape was developed long before there were fish in running streams is apparent from fossils found in the older strata, which also were of streamline shape.



How a Big Set Looks in Daytime; the Design Is Attached to a Permanent Tracing in Rattan Fixed to Lattice, Squared Like Plotting Paper, on Which Original Pattern Is Made

GRAFTED MUSCLES MOVE GLASS EYES

Movable glass eyes are reported to have been fitted successfully by a specialist of Jena, Germany. He fastens connective animal tissue to the glass and grafts this to the remnants of the subject's optical muscles so that the eye can be controlled in the same way as the natural organ. The doctor has found that in ninety out of a hundred cases involving the loss of an eye, the muscles and nerves controlling the movements of the optic are unimpaired. The grafting operation is delicate but is done in about an hour and is said to have been successful in eighty to ninety per cent of the cases attempted. Much depends upon the condition of the eye socket after the loss of the organ.

W.W. World 3/21/26

WATER HEATER OUTSIDE BOILER PROTECTED FROM FIRE

Consisting of a copper coil within an iron jacket, a water heater installed in connection with steam or hot-water systems, is placed outside the boiler or firebox so that it is not in the way when coaling, and is protected from damage and scaling by fire. On steam or vapor systems, it is connected below the water line so that the contents will stay hot even after the fires are banked. It is not difficult to install and is always in a convenient position when repairs or alterations are to be made. When used with hot-water outfitts, the contents of the copper coil is said to be warmed within fifteen degrees of the temperature of the water which goes to radiators at a minimum of 120 degrees.



Soccer Players at Jumping Practice; the Balls Are Suspended from Bar Which Can Be Adjusted to Different Heights

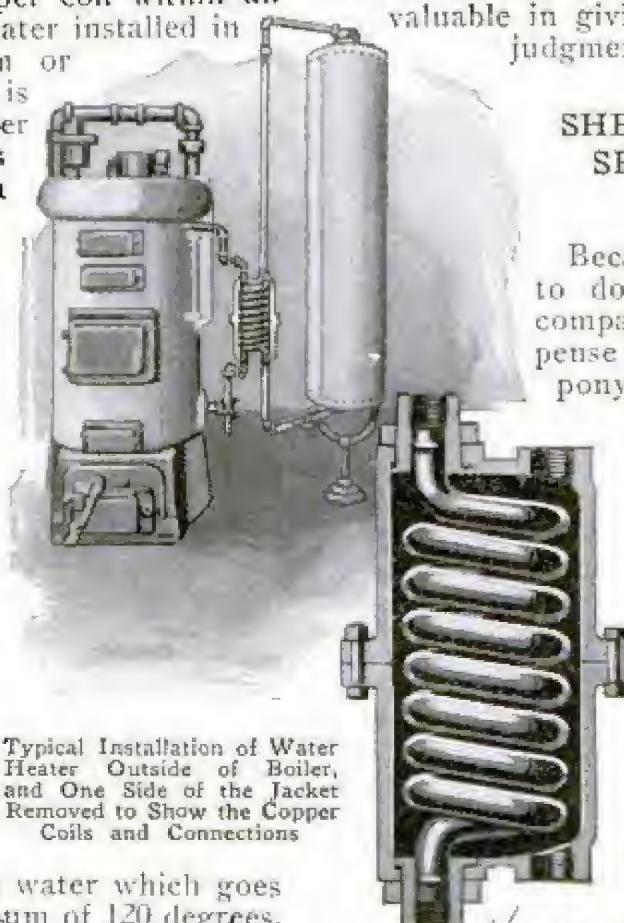
SOCER BALLS HUNG ON BAR GIVE PLAYERS PRACTICE

Soccer players at the University of Pennsylvania practice jumping and head strokes with the aid of a crossbar from which balls are suspended at different heights. Actual playing conditions are nearly duplicated with this arrangement, and the trials are said to be especially valuable in giving the men accurate judgment as well as exercise.

SHETLAND PONIES SELL ALL OVER WORLD

1748

Because of their ability to do a day's work at a comparatively small expense for food, the Shetland pony has found buyers in nearly all parts of the world. They are popular in every circus, for a musing children and, in many sections, as beasts of burden. The smallest specimens are produced in the far north of Scotland, some of them being not much larger than goats. During the fur shortage in Europe, the skins were used for women's wraps.



Typical Installation of Water Heater Outside of Boiler, and One Side of the Jacket Removed to Show the Copper Coils and Connections

Davis Engineering Corp

Kansas City Star

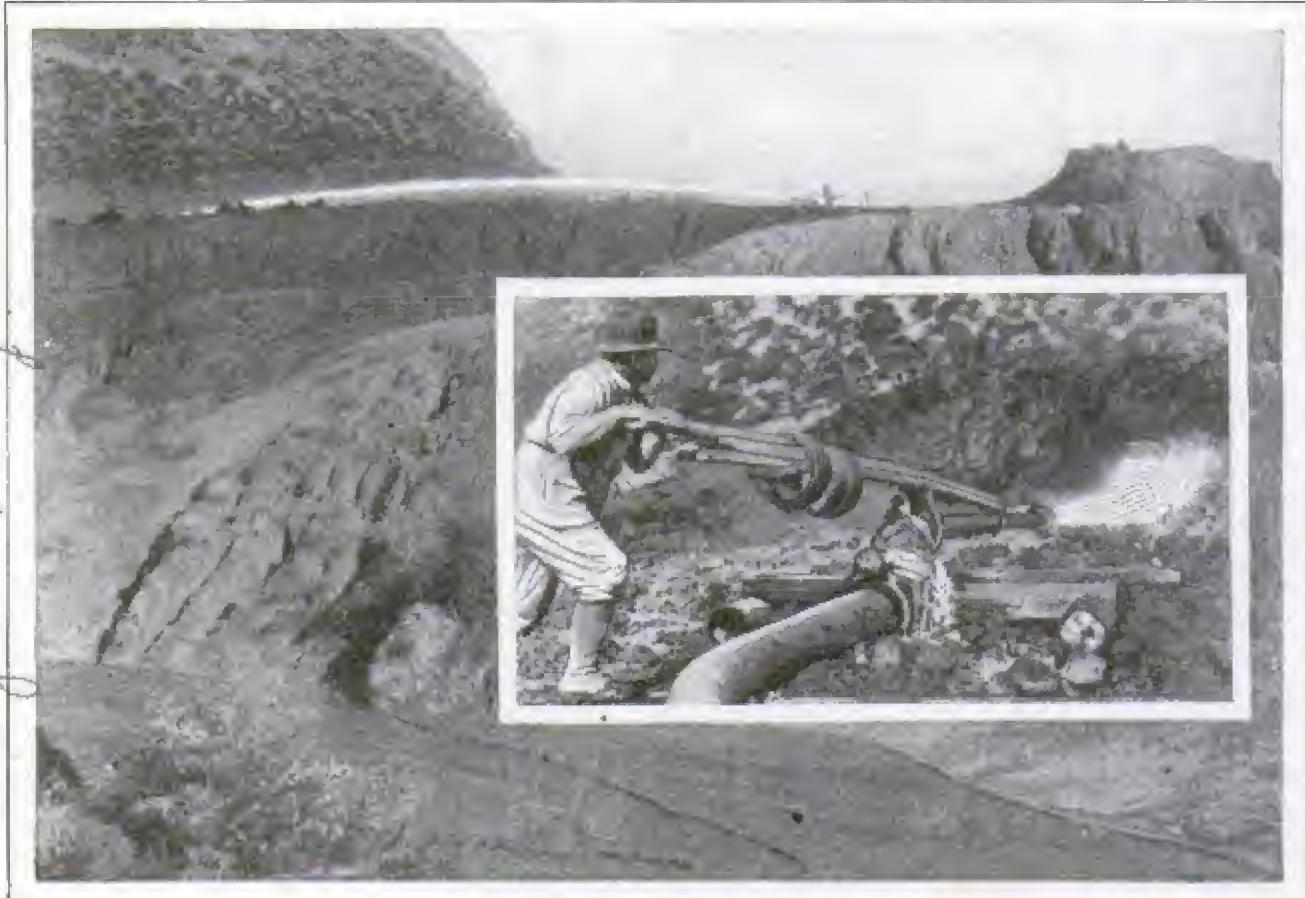
3/28/26

25 miles northwest, Los Angeles
Santa Monica range.

88 1

POPULAR MECHANICS

MOUNTAIN RAZED BY WATER TO MAKE HOMESITES



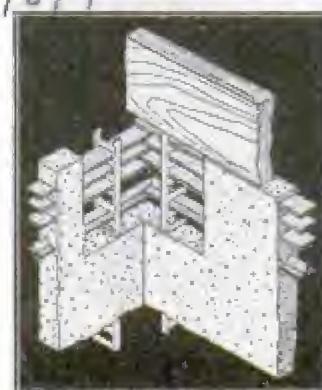
Using the Gold Seekers' Methods in Building; Washing Down a California Hill to Prepare a Site for Homes; Water Is Pumped from the Sea by Electricity

On the left margin, handwritten vertically: "Mr. W. Landrieu, 1527 N. Mar Vista Ave, Hollywood, Calif."

To prepare an area for homesites, engineers near Los Angeles are pumping sea water through long pipes and leveling a mountain with hydraulic "guns," similar to those used in mining operations. In all, about 3,000,000 cubic yards of earth are to be moved. Steam shovels, it was estimated, would have been impractical. The ocean is 500 feet below the scene of the work and the streams are drawn up through four large centrifugal pumps turned by two 200-horsepower electric motors. The pipes decrease in diameter near the nozzles until a three-inch opening is left, permitting the water to be released at 120 pounds' pressure. The stream is directed in such a way that small cliffs are formed and undermined. Thus the weight of the layers above helps break down the material where it can be washed away. Most of the formation is of gravel, but when rock is encountered, dynamite is used to assist the water. The intake is 300 feet from the shore and sieves are placed there to prevent weeds and other foreign material from clogging the inlets. To clean the screens, a valve is opened and water in the pipes up the hill rushes back with such force that all matter that has accumulated around the net-

ting is carried away. It is expected that the task will have been completed within four or five months after the start. Only a comparatively small number of men and teams are required, and the chief difficulty in the undertaking lies in moving the water-supply pipes. They are cut into sections and welded together again at the new location.

WALL WITH LADDERLIKE STUDS 1699 KEEPS PLASTER ON



On the right margin, handwritten vertically: "Brooklyn, N.Y."

Lath are laid between notches in the metal studs of a patented wall now on the market, forming shelves for the plaster, which is easily applied and less likely to fall off. The studs are secured at the top and bottom and are placed about three feet eight inches apart across the wall. The lath are spaced one and one-half inches. Walls of this type can be lined to insulate them.

Decker Development Co.

against fire, dampness and noise and are said to be much stronger than the usual types of construction. The system is especially adapted to the use of metal lath, and since the studs are of metal, there is further safeguard against fires. A sound-absorbing material and air spaces are combined to keep out loud noises

Human
**"HUMAN" CLOCK LIGHTS LAMPS
AFTER SUNDOWN / 642**

Run by electricity, a remarkable clock invented by a Washington eye specialist, is almost human. It can be set to turn on the parking lights of an automobile fifteen minutes after sundown, regardless of the daily variation in the time the sun sets. No adjustments are needed except once in four years to account for leap year. It will turn the lights off at daybreak in the same way or flash show-window lights on at sundown and turn them off at dawn. The clock tells at what time the sun rose or set on the day of a person's birth, no matter how long ago it was, or it will indicate in advance what time the sun will rise or set any particular day for years to come. The mechanism is the development of an apparatus the specialist made years ago to turn on the lights for a "human eye" sign he placed outside his office. He first devised the automatic lighting and turn-off equipment, then worked out the details of the mechanism which alters daily the time for tripping the light switch. Outwardly, the clock does not look greatly different from others, but there are two small dials that are exceedingly important. One is for setting the clock at the proper month and day when it is first started and the other for regulating the hour when the clock is to turn off the lights. It contains a self-winding apparatus operated by the house current. Should the electricity fail, the clock would still run for more than four days, the inventor declares. Government experts and others who have examined this ingenious contrivance are greatly interested in it.



Copyright, Harris & Ewing

Inventor with Clock Which He Has Adapted to Light Lamps a Definite Time after Sundown Each Day



Puller Set Up Ready for Removing Stumps: the Tackle in the Center Is Operated by Handle above Chains

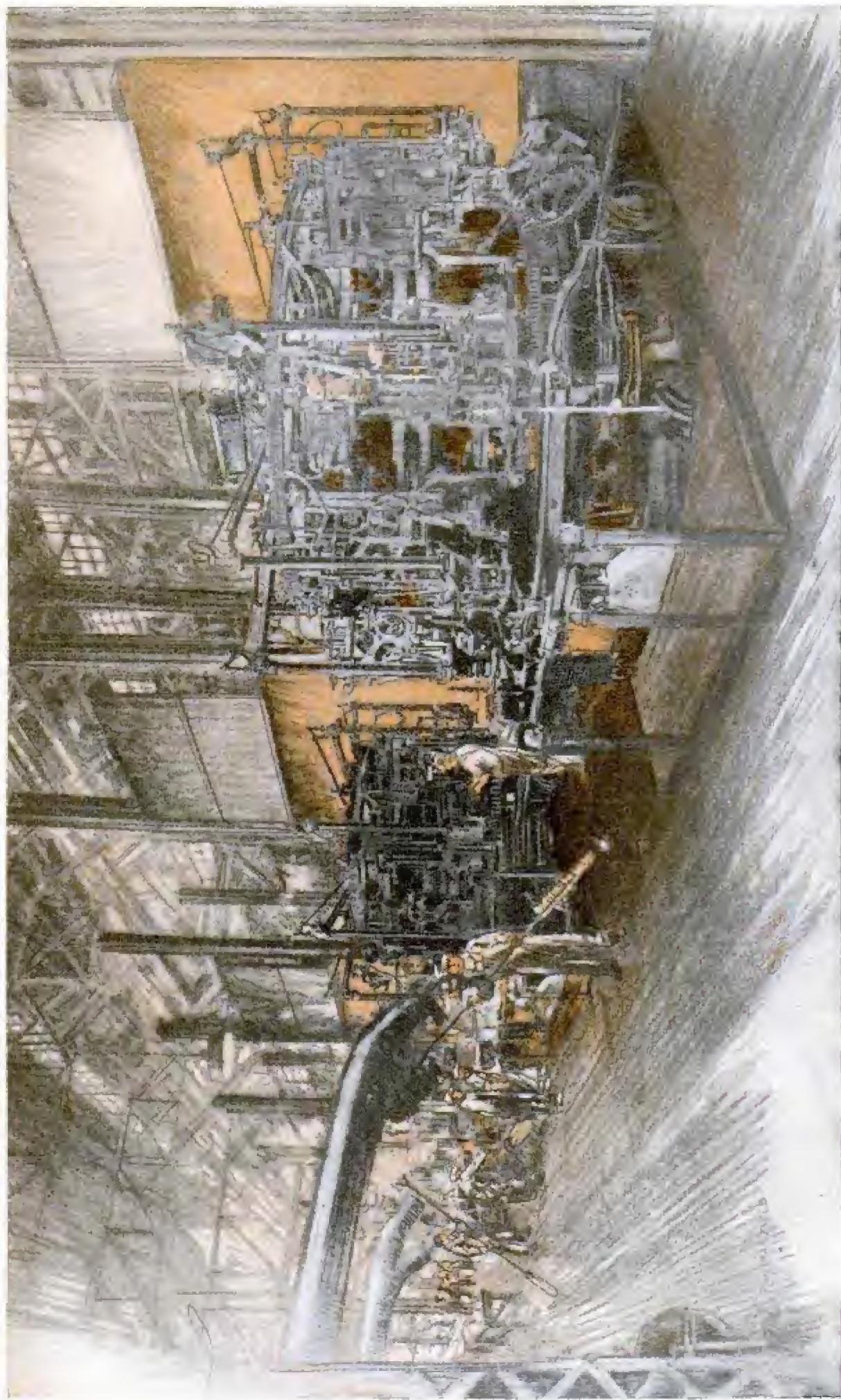
**CHAIN-SCREW STUMP PULLER
SPEEDS CLEARING LAND / 778**

Large stumps can be removed in a few moments and at a considerable saving of labor, according to reports, with a puller which has been devised for clearing cut-over forest land in Czechoslovakia. It consists of a tripod of stout wooden poles, each resting on a firm wooden base. From the center is suspended the pulling apparatus, chains to go about and under the roots of the stump, and a screw rod with a handle, which is operated by two men who stand on top of the stump. Working the handle back and forth lifts the chains, the tension being taken up by a patent arrangement at the base of the rod. In ten minutes, pine stumps are uprooted and large beech-tree stumps are torn from the ground in twenty minutes, it is said.

Cont. J. L. Welles, Eng. 4, Grosvenor Road, Bayswater, S.W. London, Eng.

1543

Alton, Ill.



Interior of a Bottle Works, Where Machines in Less Than Twenty Years Have Replaced a Highly Skilled Craft That Had Endured for Thirty-Five Centuries; the Huge Revolving Bottle Blowers Convert Molten Glass into Finished Bottles at High Speed, Their Output Depending Only on the Size of the Container's Being Blown

Electric Lungs That Mold Liquid Fire

Bottles, from Tiny Ounce Containers to Giant Carboys, Blown by Machine That Has Displaced Ancient Handcraft

By R. G. THACKWELL

A PAIR of mechanical lungs gather up a handful of molten sands, give a mighty puff of compressed air, sucked up by electricity, and out comes a completed bottle, ready to be cooled, corked and shipped to the druggist.

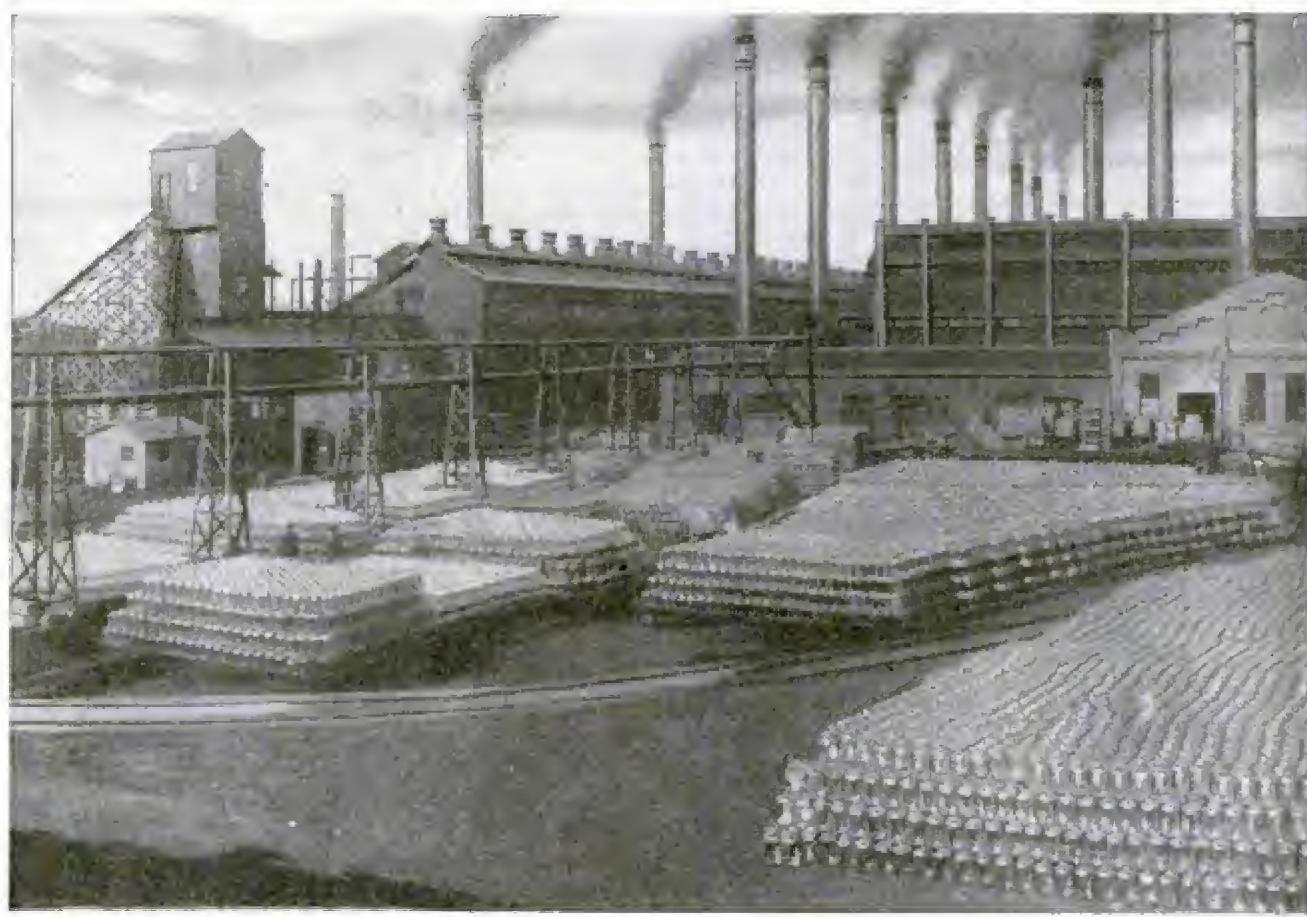
Ceaselessly revolving, the electric lungs pause for an instant, before the tons of molten glass in the furnace, grab a supply, puff it, while they swing around, into a finished bottle, drop the red-hot glass container onto a moving conveyor, and arrive back at the furnace again for another mouthful of white-hot liquid.

Twenty years ago there were no bottle-blown machines. In every glass plant skilled workers, who had learned their trade as apprentices, dipped little iron blowpipes into the big clay pots of glass, gave them a twirl to gather a bit of the molten stuff, and with their lungs blew the bottle into shape.

The pot full of glass was a little bigger than those pictured in the tombs of Egypt's kings, and the blowpipe a bit better made, but, in its essentials, the business was no different than it was thirty-five centuries ago on the banks of the Nile; than it was in the glass blowers' street of Tyre before its destruction; or than it was practiced by the titled glass blowers of Venice in the Middle Ages.

Then the glass-blowing machine was perfected, and, almost overnight, the entire industry was revolutionized. At last reports, ninety-five per cent of all the bottles made in the United States were blown by machines, and the remainder represented odd shapes, in lots so small that it didn't pay to construct the necessary molds for quantity production.

The conquest of the ancient art is one of the most fascinating stories of American inventive progress. The hand process



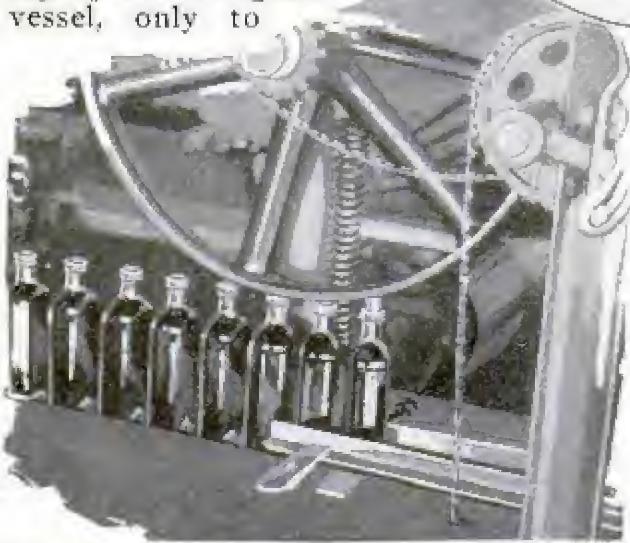
Part of the Storage Yard at an Illinois Glass Factory Where Acres of Large-Sized Bottles and Carboys Are Stored in the Open to Meet Sudden Demands; These Are All Machine-Made

was slow and required the utmost skill. It took many hours to melt a batch of material, and when the pots were emptied, the blowers must wait until new ones were prepared. Today the furnace is fed continuously, requiring no waits for fresh batches, and the mechanical lungs of the machine never tire or wear out.

Anything, from a tiny ounce bottle to a huge acid carboy, holding ten gallons or more, can be blown on the same machine, the only difference being the quantity of the output—big bottles take more and small ones less time. The machines have six, ten or fifteen arms, each arm a complete bottle blower, with the fingers, lungs and mold of the old-time human worker.

On small bottles, a ten-arm machine will make a complete revolution in ten seconds, turning out a bottle every second. Change the molds to gallon size, and the output is reduced to a bottle every four seconds. The biggest carboy machine in the world, standing twenty feet high and weighing 240,000 pounds, makes a revolution every minute, and a carboy every six seconds.

The blowing of a bottle, however, does not complete its making, for it is equally important that it be properly cooled. Anyone who has poured boiling liquid into a glass vessel, only to



Photos Courtesy
Illinois Glass Co.

Bottles Passing through the Filling Machine, Above, a Corner of the Packing Department, Where the Still Hot Glass Is Prepared for Shipping, and a Corking Wheel, Bottom, Which Displaces Much Hand Labor



have it crack under the sudden expansion of the layer of glass next to the heat, can appreciate the terrific strains set up by the cooling of molten glass into hard crystal. To offset this strain, the newly made bottles are cooled gradually in a long heated tunnel, called a "lehr." Moving down its length so slowly that ten or twelve hours are taken to travel seventy-five feet, the bottles finally emerge cooled to room temperature.

Any type of blown container can be made on a bottle machine, but some types are still largely made by other processes, notably fruit jars and milk bottles. Owing to their wide mouths, which permit removal of a collapsible molding core, most of these articles, like table glasses, are pressed. Some fruit jars, however, are already being blown.

The slim, straight vials in which the druggist supplies the doctor's pills, are another exception to the general adoption of the blowing machine. Instead of being blown from the molten glass, these vials are cut from glass tubes, but the old hand process has been replaced by machinery which draws a tube directly from the fur-

nace, pulling out mile after mile of uniform size and wall thickness, cuts it into lengths, and turns out finished vials, complete with bottom and corking ring or ridges.

The vials, and the druggists' prescription bottles, are put through an unusual cleaning process in the factory where they are made. So, when the druggist starts to compound a prescription he doesn't have to stop to wash the bottle.

"CAFETERIA" MINE SUPPLIES COAL TO ALASKANS 184

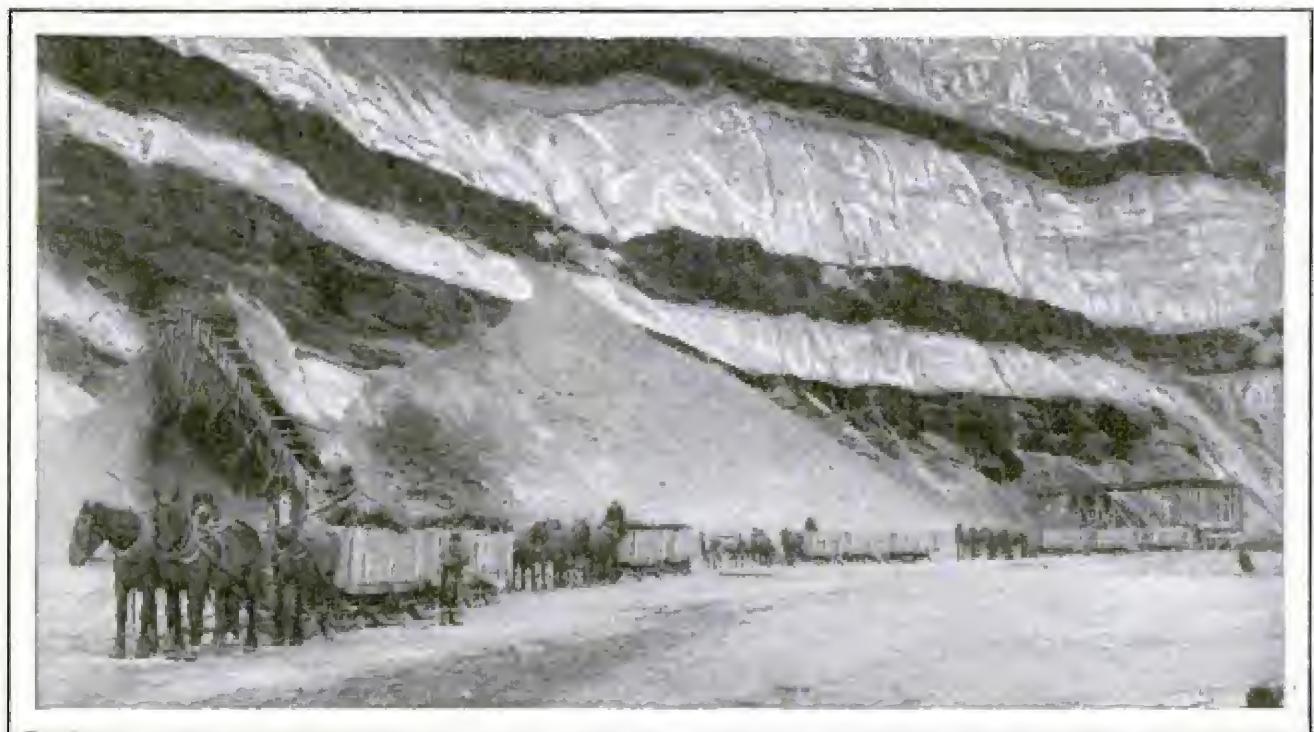
While much of the millions of tons of bituminous coal that underlies Alaska is difficult to reach, a rich deposit near the town of Healey is exposed so that now the coal may be loaded directly from the veins to the cars. Before the railroad built a spur to the mine, the company operating it hauled the fuel on bobsleds down the bed of the river which had exposed the deposits. Geologists estimate that it took thousands of years for the stream to cut through the hills and lay bare the streaks of coal which is now shipped to various parts of the territory.



Giving a Demonstration inside Motorbus Fitted Up as Tool Shop and Display Room for Prospective Purchasers

MOTORBUS USED AS TOOL SHOP FOR DEMONSTRATION 173

Products of an eastern tool-manufacturing company are exhibited in a motorbus fitted as a traveling shop. The coach contains a special electric generator for supplying current, to show how the power-operated pieces are handled, and is furnished with fans, upholstered seats and carpets for the comfort of visitors. Three men travel with the bus, a driver, an advertising representative and a demonstrator.

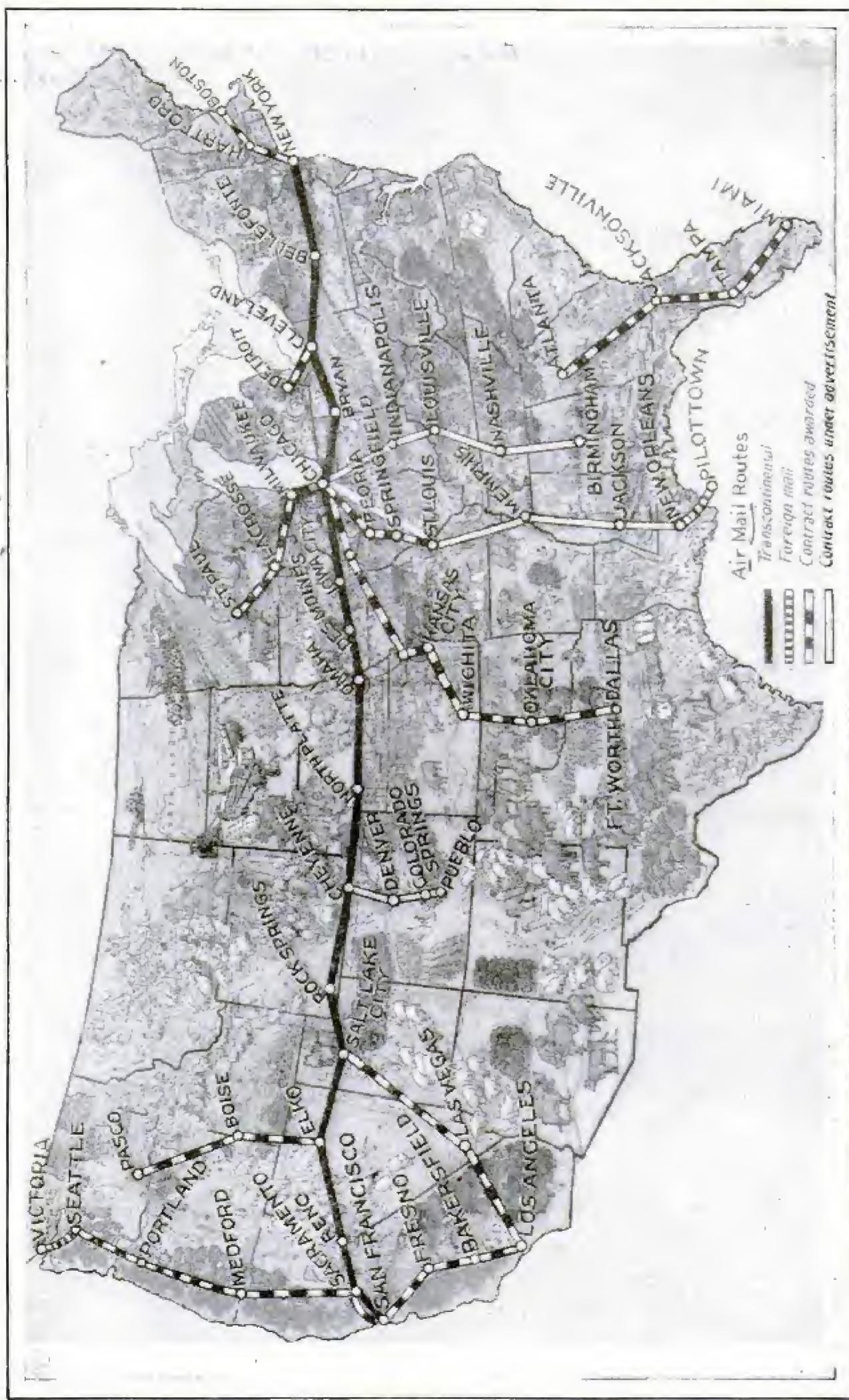


Where a River Did Alaskans a Good Turn; Exposed Layers of Bituminous Coal near Healey; Sled Loads of It Were Hauled Away with Little Digging and Now a Railroad Spur Leads to the Mine

Out. Rob Becker, Chicago Tribune

1579

17, 7 St. Paul St. Baltimore, Md.



Fruit Growers of the West and Florida, Ranchers of Texas, Miners of the Northwest and Farmers of the Plains Are All Brought in Quick Communication with the East by the Growing Network of Air-Mail Lines; the Post Office Also Operates Two "Foreign" Routes, Meeting Ships at Vancouver, B. C., and at Pilottown, Mississippi.

1719 St. Paul St.
15

POPULAR MECHANICS

95

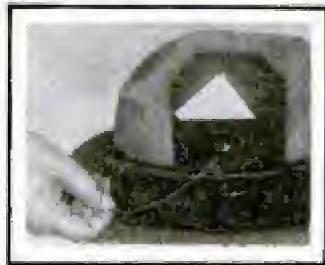
Baltimore, Md.

AIR-MAIL ROUTES FAST LINKING
EVERY SECTION OF U. S.

Letting of contracts for several additional air-mail routes by the post office department is maintaining America's position as the leading air-mail country of the world. When additional lines, for which bids have been asked, are put in service, practically all of the more densely populated sections of the country will have air service. The original New York-San Francisco route, which will continue to be operated by the department, is supplemented, under the new law, by a network of contract lines. In the east a contract route connects Boston and Hartford with the New York terminal of the transcontinental line, while Cleveland, Detroit and Chicago are joined by the Ford planes, which also carry factory mail and small parts between the three cities. Chicago remains the main air-mail center, with the cross-country lines east and west, four contract lines already awarded, and two more to be let this year. The west is to have a line from Denver south to Pueblo, and already has routes from Salt Lake City to Los Angeles, Elko, Nev., to Pasco, Wash., San Francisco to Los Angeles and San Francisco to Seattle. The latter connects with one of the two foreign mail air lines.

FISHHOOK BOOK ON HATBAND
PREVENTS LOSS *1625*

Fitted with several compartments for holding hooks, flies and other pieces of tackle, a durable book attached to the fisherman's hatband keeps the articles handy for use and less likely to be lost. The holder is secured tightly to the band, goes about halfway around the hat, is waterproof and is held in place with an elastic band.



DETACHABLE NON-SLIP
TREADS FOR SHOES *1595*

Common shoes are converted into pegged soles for outing and working purposes by means of a pair of detachable steel treads now on the mar-



Golfers Wearing Detachable Treads Find the Going Easier When the Course Is Soft; the Cleats Do Not Damage Turf

ket. Not only can they be removed but are also adjustable to different sizes, quickly clamped on and durable. Golfers, fishermen, workers, hikers and hunters are spared the necessity of buying a special pair of shoes with these attachments.

BIRDS AS BUILDERS OF HOMES
RIVAL MAN IN SKILL *1736*

While men pride themselves on their ingenuity in construction, a glimpse at the world of birds reveals that they long have been skilled in the art of building. For instance, some are plasterers and carpenters, others are weavers and stitchers and still others have learned how to erect canopies to shield them from adverse weather and from enemies. The titmouse weaves an insulating material to protect its eggs from extreme temperatures. Robins and other birds are experts at repairing and renovating old nests, and some species display amazing skill at selecting the most suitable locations for their homes. The brown heron builds a three-room house, and the bower bird fashions play spaces of grasses and twigs.

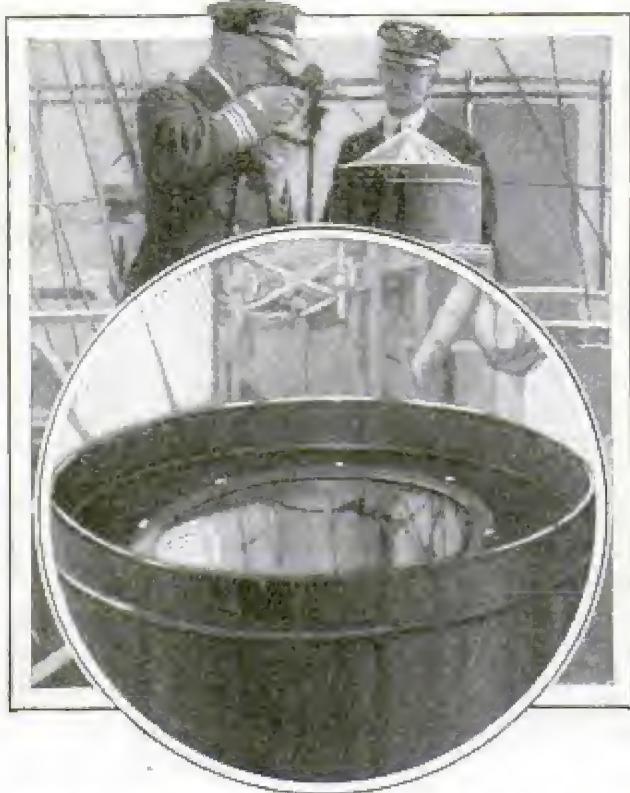
Campbell Specialty Co.

Robert M. Sexton
Editor, Popular Mechanics

Read Co. Capital and
6/25 1925

1962 Perry gyroscope
Manhattan Bridge Plaza *Telephone*
96 POPULAR MECHANICS
Brooklyn, N.Y.

ARTIFICIAL HORIZON ON SHIP
AIDS IN ICE PATROL



Horizon Instrument in Use, and View of Interior, Showing the Mirror and Holder

The gyroscope has been further adapted to making navigation safer and simpler in an artificial-horizon apparatus recently installed on the "Modoc," a United States coast-guard cutter detailed to the ice patrol in the northern Atlantic. By means of this instrument, readings can be taken from the stars or sun when visible, even when the natural horizon is obscured by fogs. It consists of a highly polished mirror, mounted on a gyroscope, and a pendulum. The gyroscope keeps it at a uniform horizontal position in spite of the movements of the ship. Another type of artificial horizon has been used for some time on land. It consists simply of a bowl of mercury which is kept free from dirt and impurities and absolutely motionless. Movements of the ship precluded the use of such an apparatus at sea, but the mirror and the gyroscope are said to have solved the problem. In addition to this equipment, the "Modoc" will carry a radio compass and four transmitters.

196 FLAKED GLASS IN OFFICE DOORS
MADE LIKE ARROWHEADS

In manufacturing the flaked glass used in partitions and doors, a process similar to that employed by the Indians in making arrowheads from flint is followed. An automatically controlled gas furnace is

used instead of a fire, but one of the basic principles, that of contraction, is the same. The Indians let drops of cold water fall on the flint after heating it, each drop causing a chip of the stone to fly off because of the sudden contraction. In making the glass, it is first sandblasted to give it a frosted surface, then coated with glue and subjected to gradual drying in the oven. This causes the adhesive to shrink and pull small flakes of glass with it.

122 GAS FLAMES PURIFY SOUNDS
FROM PHONOGRAPH

Gas flames are known to be extremely sensitive to sounds and now an eastern inventor has made practical use of this fact by applying it to a phonograph, a utility company reports. Gas is introduced directly to one side of the diaphragm in the sound box of the instrument, passing thence to an upright U-shaped burner. The sound waves from the diaphragm are transmitted to the gas which is consumed in a series of small jets on the two arms of the burner. While a record is playing, the pulsation of the flames indicates that they are being used as a reproducing medium, softening and purifying the tonal quality. When the gas is turned off the tone becomes flatter.

AID FOR PERSONS PARTLY DEAF
REQUIRES NO BATTERY

Ordinary conversation and musical tones are said to be magnified without buzzing or distortion in a small attachment for the hard of hearing that has no cord or battery and is not conspicuous. Its theory of operation is illustrated in the accompanying diagram. The balls in the upper drawing are numbered to conform to the hearing attachment's chambers represented underneath. If the largest ball is struck first, the force is communicated to the others, causing the smallest ball to swing more than the largest. Sound impulses are thus amplified in the chamber next to the ear.

American Telephone Co.
1943 31 New York

Lot 850 3/26/26

Fighting Insect Foes

Enlarged Specimen of
Destructive Hornet, Feed-
ing on Bruised Peaches at
a Government Experi-
mental Farm



Ceaseless Study of Collections from Every Section of Globe Solve Secret of Exterminating the Harmful

By EMMET DOUGHERTY, 514 Woodward Bldg.
Washington, D. C.

NO COLD ANNIBALS and slaves, murderers and beggars, narcotic peddlers and drinkers of nothing but pure alcohol, 300,000 kinds of different beings, each with its own peculiar traits, are numbered among the moths, butterflies, beetles and other insects that are stored away in the vast fireproof vaults of the Smithsonian Institution.

Here, in the midst of the world's most valuable single collection of insects, scientists are constantly at work studying and classifying, probing into the life habits of each, in order that the good insects may be turned against the bad, to make the world a better place to live.

From Asia the Japanese beetle found its way to this country and in a few years threatened untold damage to agriculture. The scientists poring over their cases of mounted insects and studying the life history of each discovered that an insect called the ladybird bore a grudge against the Japanese beetle. Promptly the army of the ladybirds was augmented a thousandfold through subsidy by the government of the United States, and in millions was then turned loose on the unsuspecting visitors from Asia. A sanguinary battle started on a hundred fronts, and is

still raging, with the prospect that the sheer weight of ladybird numbers, plus healthy appetites for Japanese beetles, will save the farmers. In California one county has established its own army of ladybird mercenaries, raises them on a ladybird farm and sells them at cost, a cent or two each, to the fruit growers.

Three hundred thousand different species of insects appears to be a number past imagining, but it represents less than half the known species, and probably not more than one-twentieth of the existing kinds. Scientists, at the last count, had classified 640,920 different kinds, one-tenth of the world's total, and were adding to that list at the rate of some 6,000 species a year.

As they classify and study them, separating the harmless from the bad, and the good from the harmless, they also seek for the antidote, poison or enemy, to attack the harmful. So far the worst enemies of any insect are other insects.

Dr. Austin Clark, curator of the institution, who has made a special study of the life habits of a vast number of classes, in his writings on "Animals of Land and Sea," tells many of the queer habits, unusual tastes and strange alliances that exist in the insect world.



At the Left, Wheel Bugs, Raised in the West and Sold to Fruit Growers to Attack the San Jose Scale; Above, at the Right, Is an Aviator's Fur Helmet with Almost All of the Fur Eaten Away by the Common Clothes Moth, While Its Larvæ Have Begun to Attack the Leather; Below Is the Male Gypsy Moth

"As an exclusive diet," he says, "red pepper would seem to most of us to be quite unattractive, but there is one beetle which will live happily all its life on red pepper with never a thought that it is doing anything out of the ordinary."

Many of the beetles and other insects are cannibals, living on their weaker relatives; others are murderers who prey on other species. "All spiders," says Dr. Clark, "aside from certain mites, and all scorpions and centipedes are throughout their lives carnivorous, catching and devouring insects of various sorts, and sometimes other creatures.

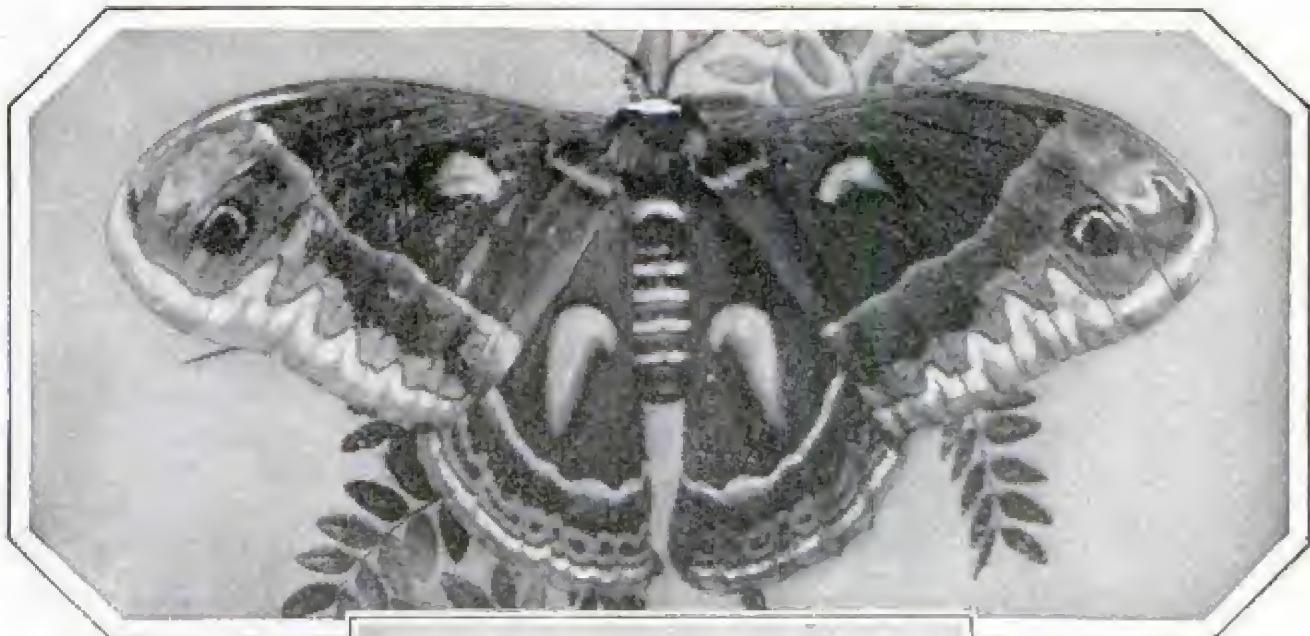
"Beggars never making any attempt to work, and indeed incapable of doing anything at all, occur among insects," the Smithsonian curator continues. "Beetles of this description live in ants' nests where they are cared for by the ants with as much solicitude as if they were their own young.

"Helpless beggars asking charity are one thing; energetic and powerful ruffians enforcing charity quite another. Certain ants come in the latter category. Beyond raiding the nests of other ants, killing the

workers and carrying off the pupæ, they do no work.

"Narcotic peddlers have their representatives among the insects. There is a curious bug in Java which feeds on ants. When an ant approaches it rises up, exposing some long hairs on the underside which are wet with a secretion from some special glands. The ant greedily licks off this substance, which, however, is intoxicating. When the ant has had enough to make it 'groggy,' the bug with its sharp beak stabs it suddenly through the neck and sucks its juices out."

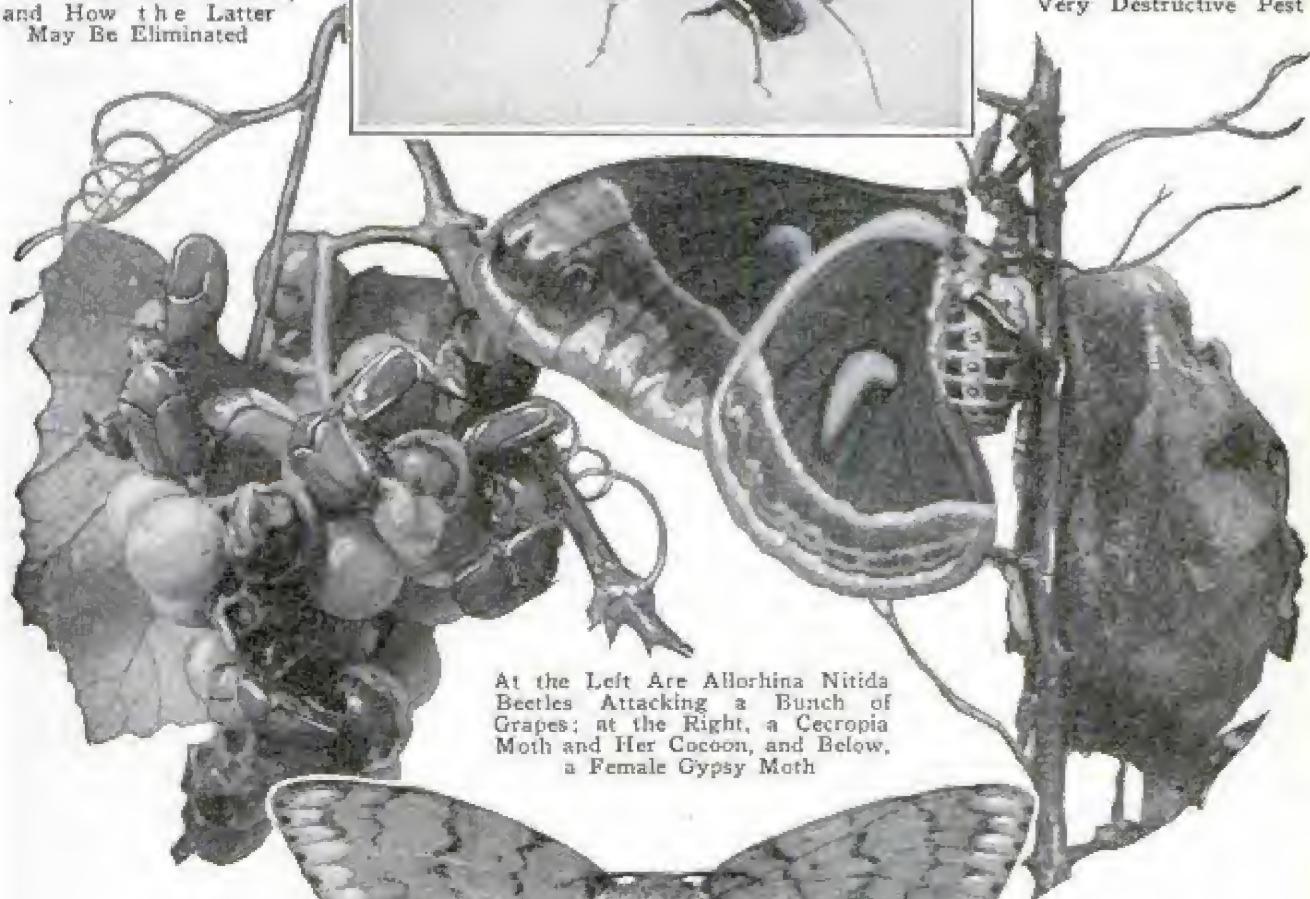
Equally curious are the habits of the tiny, pale fly which buzzes around fruit, and especially grapes, which hold the greatest attraction for it. The little fly lives entirely on an alcohol diet, getting it from the fermenting particles of a bruised grape.



Above Is a Cecropia Moth, One of the Most Beautiful Types in the Huge Collection Gathered at Washington as Part of the Government's Work Toward Classifying Every Insect to Determine Which Are Helpful and Which Are Harmful, and How the Latter May Be Eliminated



One of the Wars Started by the Government between Insects: Scientists Sicked This Little Ladybird, Center, on the Big Japanese Beetle and Got It Done to Death. But the Ladybird Is Perfectly Harmless and the Beetle a Very Destructive Pest



At the Left Are Allorhina Nitida Beetles Attacking a Bunch of Grapes; at the Right, a Cecropia Moth and Her Cocoon, and Below, a Female Gypsy Moth



James J. Walker

BIG LETTER SENT BY AIR MAIL MARKS POSTAL PROGRESS

1852 Days of the pioneers were recalled recently when a pony-express postage stamp appeared in the mails, but it was a huge replica of a real stamp and

made and the work is done at greater heights. In New York, for instance, a crew of eleven riggers was required this season to set up the trapezes. Close to the roof at times, they were eighty feet above the floor, hanging from slender girders by their



George E. Cryer
was attached to a monster envelope bearing greetings from the mayor of Los Angeles to the mayor of New York city. The occasion of its sending was the opening of air-mail service between the two coast cities. The new line to Los Angeles makes connection with the main aerial route at Salt Lake City.

Mayor Cryer and His Secretary, Miss Marian Voss, with Huge Letter Sent by Airplane to Mayor Walker

knees now and then, in order to tighten this rope or loosen that stay to give the set the proper rigidity and "give," for a nice balance of the two is essential to the success of the act. In all, some 265 sets of cables had to be rigged and tested. Many acrobat troupes endeavor to hire the same riggers season after season if they prove efficient, for the error of a "green" or careless man may be disastrous.

RIGGERS OF CIRCUS TRAPEZES FACE MANY PERILS

1932 If you will step under the "big top" early the morning the circus reaches town, you will see a number of agile, over-allled figures perilously swaying on slender supports high above the ground. They are busy rigging the intricate cables and braces for the aerial-trapeze set, on which, later, the spangled acrobats will perform their death-defying leaps and turns. No blaring bands or applauding crowds greet the riggers, although they often do stunts far more dangerous than those of the aerial actors and without a lifenet below to protect them in case they should fall. Upon their skill and thoroughness depends much of the success of the trapeze act and perhaps the lives of the performers. At Madison Square garden, in the Coliseum in Chicago, and in other indoor auditoriums where the circus is held, the riggers face even greater risks than under the canvas, for special adjustments must be

1904 BABY ELECTRIC WASHER FITS INTO SMALL APARTMENT

Intended especially for small homes or apartments, a light and compact electric washer will hold the equivalent of six shirts at one time, operates at three different speeds from a lighting socket and is said to make little noise. When running, a plunger mounted a little off center cleanses the wash.



Eden Washer Corp.
244 W. Randolph St.

3/26/26

FABRIC OF HOLLOW FIBER RETAINS WARMTH 1693

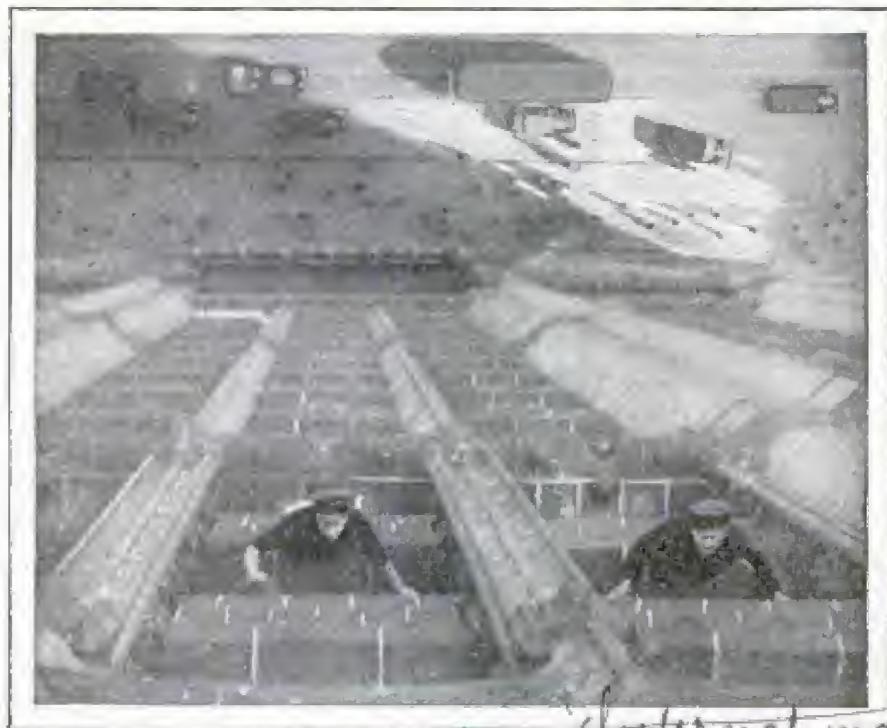
Consisting of minute hollow-fiber tubes, made of the same material as artificial silk, a new fabric for clothing has been tested by the bureau of standards. Its threads are said to be more opaque to light than solid ones, permitting a lighter and thinner weaving for the same covering power and practically the same strength. The chief advantage of the material is in its warmth-holding properties. Wool, feathers and other coverings are effective in that they keep a warm blanket of air close to the body, while other fabrics permit too much circulation or allow the heat to escape. The hollow-fiber fabric imprisons air in its tubes so that clothing made from this material is expected to be warmer than that from many other kinds of cloth. The bureau has been studying the new fabric in connection with tests on blankets of different types and for various purposes.

FIND SLAVERY STILL EXISTS IN AFRICA AND ARABIA 1693

Traffic in slaves still flourishes between Africa and Arabia, according to Sir Frederick Lugard, a former governor of Nigeria. It is estimated that as many as 30,000 human beings are sold into servitude yearly in that part of the world and the slave trade is said to be rife also in certain parts of Morocco, in the Libyan desert and in Angola. Whole areas are reported to have been denuded of inhabitants because of the traffic from Abyssinia to Arabia across the Red Sea. Over two years ago, a body of experts was appointed by the League of Nations to investigate slavery conditions and find ways whereby it might be wiped out.



Curious Chinese Temple Bell; It Was Rung with a Log Struck against Projecting "Buttons"



An Unusual View from the Woolworth Building; Looking Down on Window Washers Hard at Their Spring Cleaning

International

WINDOW-CLEANERS RISK LIVES 1698 AT DAILY TASK

Washing the grime from buildings in New York city proved an unusually difficult task this year after the winter of soft-coal burning and called attention to the workers who daily risk their lives in cleaning the windows of tall skyscrapers and other parts of lofty structures. From the fiftieth story of the Woolworth building, the window washers could get an unusual view of Broadway while at their task. The annual cleaning bill for cities throughout the country runs into millions.

ANCIENT CHINESE TEMPLE BELL RUNG WITH LOG 1698

One of the latest pieces added to the collection of the American museum is a Chinese temple bell cast about 1,000 years before the Christian era. It differs from modern chimes in that it is elliptical in shape and has no clapper. To strike it, a wooden log was swung against one of the projecting "buttons" producing different notes which are thought to have been used to tune the temple orchestra.

Christian Science Monitor

1698 3/26

denberl Bradbury Red
W. about first new post. Red



Artist with Samples of His Work, Including a Silhouette of the Young Woman Model at the Right

PORTRAITS CUT WITH SCISSORS IN NATURAL COLORS

Lifelike portraits and sketches are cut out of paper and other material by a Cuban artist with an ordinary pair of scissors. Natural colors produce more realistic effects and the figures are prepared in silhouette or in side or full front view.

1538 BARN SWALLOW AND BOBOLINK WINTER SOUTH OF EQUATOR

Further interesting facts concerning the migratory habits of birds have been gathered by Dr. Alexander Wetmore, assistant secretary of the Smithsonian institution, who has returned from the southern countries of South America after a study of this phase of wild life. He found that the common barn swallow and bobolink go

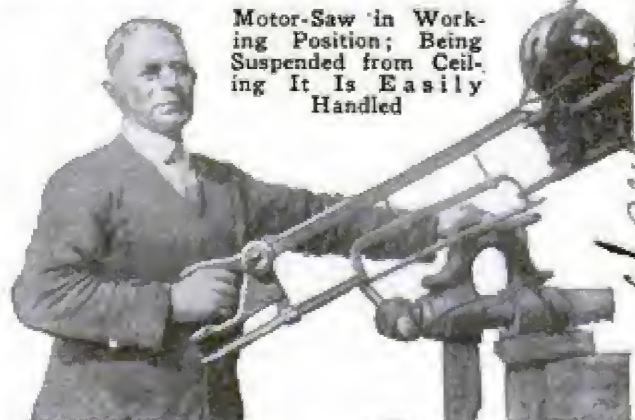
Washington, D. C.

south of the equator for the winter, making their homes in the palm groves of Argentina and Uruguay. Then they return from the land of the tango and wing their way back thousands of miles to the United States and Canada. This long flight, twice a year, is considered remarkable, as these birds are not commonly regarded as distance fliers and most of the kinds that go south, stop north of the equator. Among these are the yellow-billed cuckoo, cliff swallow, olive-beaked thrush and nighthawk, which are of more or less common occurrence in the northern part of South America, but not found in abundance.

1538 COUNTERBALANCED MOTOR SAW HUNG FROM CEILING

Easily moved to any part of the shop, a motor-driven saw now on the market can be used either vertically or horizontally and is adapted to cutting steel, wood or bone in much less time than is required with the

ordinary tool. In a test, it severed a one-inch soft-steel bolt in fifteen seconds, while two and one-half minutes was the time required with a handsaw. It is suspended by a cable and counterweight and may be adjusted from the ceiling to almost any position on a workbench.



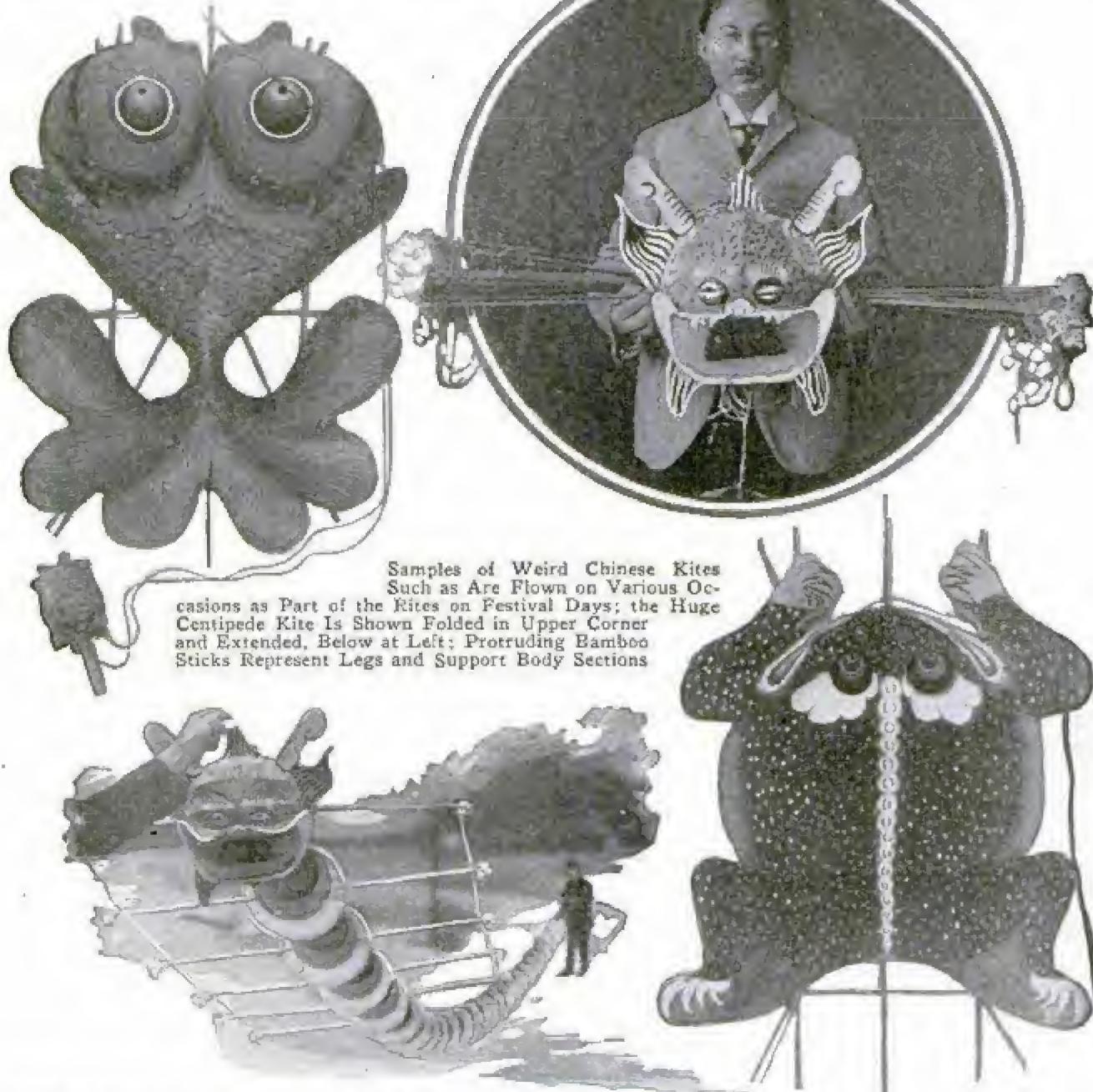
Motor-Saw in Working Position; Being Suspended from Ceiling It Is Easily Handled

Motor Ads Co,
112 Broadway

KITE FLYING IS PART OF WEIRD CHINESE RITES

Kite flying is more than a pastime in China, for the fantastic replicas of animals and insects displayed are emblematic of good fortune or suggest old legends,

flown; a cord is attached to three or more parts of its length in order to keep it un-



Samples of Weird Chinese Kites Such as Are Flown on Various Occasions as Part of the Rites on Festival Days; the Huge Centipede Kite Is Shown Folded in Upper Corner and Extended, Below at Left; Protruding Bamboo Sticks Represent Legs and Support Body Sections

and they are flown as part of the rites in observance of certain festival days. Heavy rice paper is the principal kite material, while the use of gaudy colors and decorations gives the flyers a weird appearance. One of the most remarkable of all the Chinese kites is that which represents a gigantic centipede. It measures nearly forty feet in length and is made to fold up like an accordion. There is a head with protruding horns, huge eyes and gaping mouth, and the body is formed of a number of bamboo sticks running crosswise to the center with pasteboard disks attached to them. While the kite is being

held control and, in strong winds, several men are needed to hold the reel. Kites are said to have been flown as early as the third century B.C. in China; and in Europe in the seventeenth century A.D.

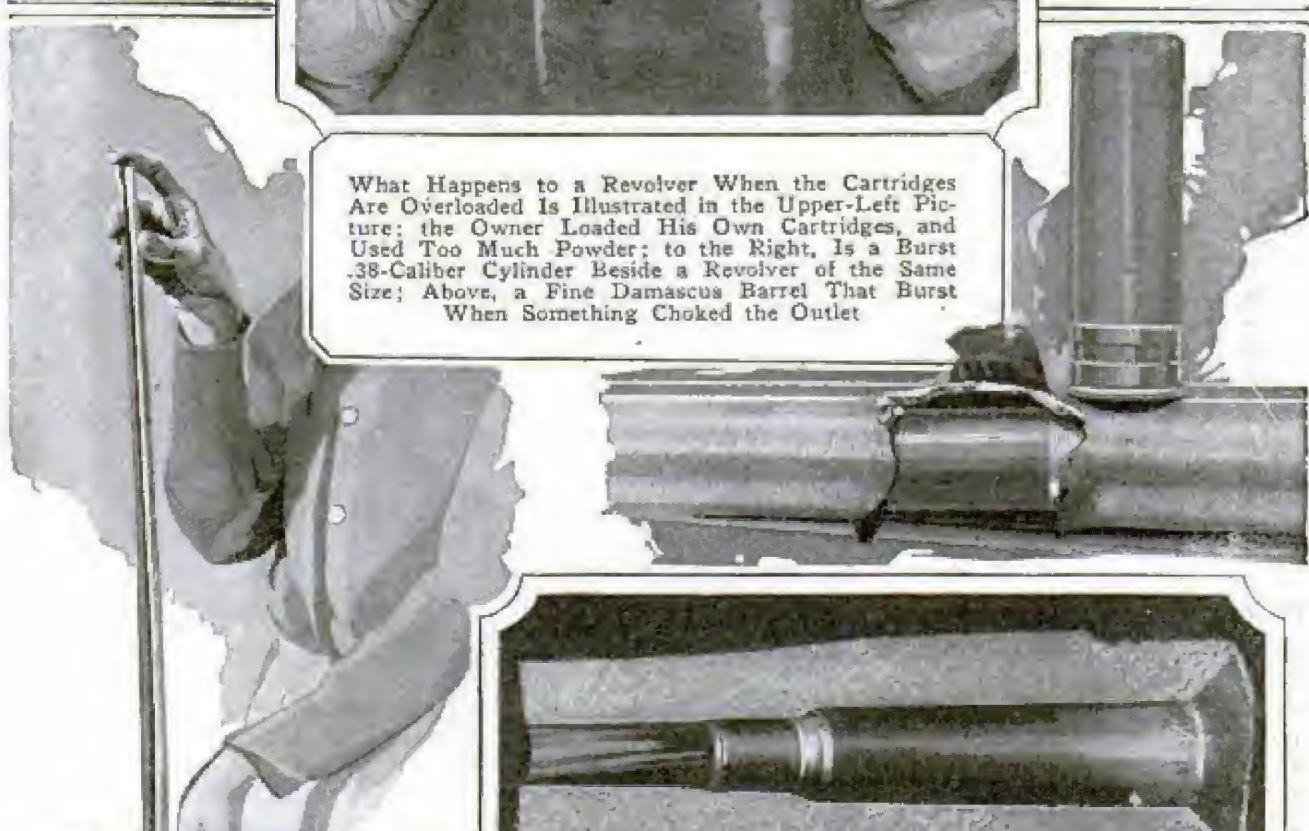
182. SHOES OF SNAKE SKIN

Python skin is one of the latest leather substitutes introduced in London for women's shoes. A pair of this material costs from \$30 to \$35. Anaconda, boa-constrictor, iguana, shark and seal skins are also in demand for footwear.

N.Y. Times 4/11/26



What Happens to a Revolver When the Cartridges Are Overloaded Is Illustrated in the Upper-Left Picture; the Owner Loaded His Own Cartridges, and Used Too Much Powder; to the Right, Is a Burst .38-Caliber Cylinder Beside a Revolver of the Same Size; Above, a Fine Damascus Barrel That Burst When Something Choked the Outlet



Split from End to End, a Springfield Rifle Barrel Which Was Fired Twice, Once with Mud in the Barrel and Then a Normal Shot; a Cleaning Patch or Greased Plug Will Do the Same Thing

Above, Twenty-Gauge Shell in Barrel of Twelve-Gauge Shotgun, Fired with a Twelve-Gauge Shell; Below, Chamber of Army Rifle Split in Half

Why Hunters' Guns Blow Up

How to Avoid Accidents with Your Rifle, Pistol or Shotgun by Proper Care

By CAPT. EDWARD C. CROSSMAN

*Brentwood
Weight City*

SEVEN million persons went hunting last year. A few returned with the wreck of what was once a good rifle or shotgun or pistol. Some of them came back minus a finger or two. A few occupied space in the obituary column.

It is not surprising that some of the great army of firearms users come to grief. The guns they use develop terrific internal pressure when the trigger is pulled. Few steam boilers develop more than 400 pounds a square inch, but the lowest pressure in a gun barrel, when a shot is fired, is that of the shotgun, and this may run as low as 6,700 pounds a square inch. The highest pressure is that of the military type of rifle which develops from 45,000 to 50,000 pounds per square inch of chamber area. So it is not surprising that ignorant or careless people come to grief when using engines of such power.

Most guns are perfectly safe when used with the loads intended for them and when the barrels contain no obstruction, such as mud, snow, cleaning rags, brass brushes or shells of smaller gauge, which may be dropped into the chamber and stick in the bore of the gun. Gun and ammunition factories say that ninety-five per cent of the trouble is the fault of the user.

There have occurred the past few years, however, a number of accidents not at all the fault of the user, since the development of a new variety of shotgun powder which gives high pressures farther along the length of the barrel. Some of the cheaper guns or those designed many years ago with very light barrels, have failed to stand the pressure of the "progressive-burning" type of shotgun powder. Therefore, it is well for the shotgun owner

not to attempt to shoot the heaviest loads out of very old, cheap, or light shotguns, even though these loads are sold in every store and are entirely safe in guns designed for them.

The first health hint for the firearms user is never to try to shoot an obstruction out of the gun barrel. The second is to look through the barrel or pass a rod through it any time there is any doubt—such as a misfired cartridge, or a report that sounds wrong or a shot that fails to hit or give any indication that it has left the gun.

A great number of accidents occur when the first shot is fired, indicating that a cleaning patch, a brush, or even a coating of heavy grease had been left in the barrel. Also there is the chance that somebody may have tinkered with the gun. The small boy or girl might have dropped something down the muzzle.

A coating of heavy grease is very likely to blow up or bulge the barrel. The grease tends to dry, and it piles up in front of the wad or bullet, until it offers enough resistance to burst or injure the barrel. Light oil in the bore does no harm, but no gun should be fired with heavy grease in the bore, fresh or old.

Contrary to popular belief, sealing the barrel of a gun does not necessarily blow it up. One can stretch thin paper tightly over the muzzle of a gun without bursting it. What causes a barrel to blow up is some weighty or sticky substance that

will check the speed of the shot or bullet and set up what is called "wave action" in the powder gases following down the barrel. An inch of sticky mud in the bottom of the barrel of a shotgun, but not at all sealing the bore, is enough to blow it up.



Experts Blew Up the Second Barrel to See What Wrecked the First; a Double Load of Dense Powder Caused the Havoc

A shotgun shell that does not sound normal or kicks or misfires should stop all shooting until investigation is made. At times a defective primer, or an insufficient load of powder, has force enough to push the load of shot and the wads out into the barrel, but not enough force to drive them clear through. The next shot may burst the barrel.

Another cause for blown-up shotgun barrels is that the base wad, a cup-shaped cardboard piece that forms part of the base of the shell, is not held firmly in the shell head, and is drawn up into the bore of the gun. The next shot is likely to bulge or burst the barrel. Many old hunters blow through the barrel each time they open the gun. Any obstruction would cause the fumes of the powder, remaining in the barrel, to puff back into the face and cause the shooter to look

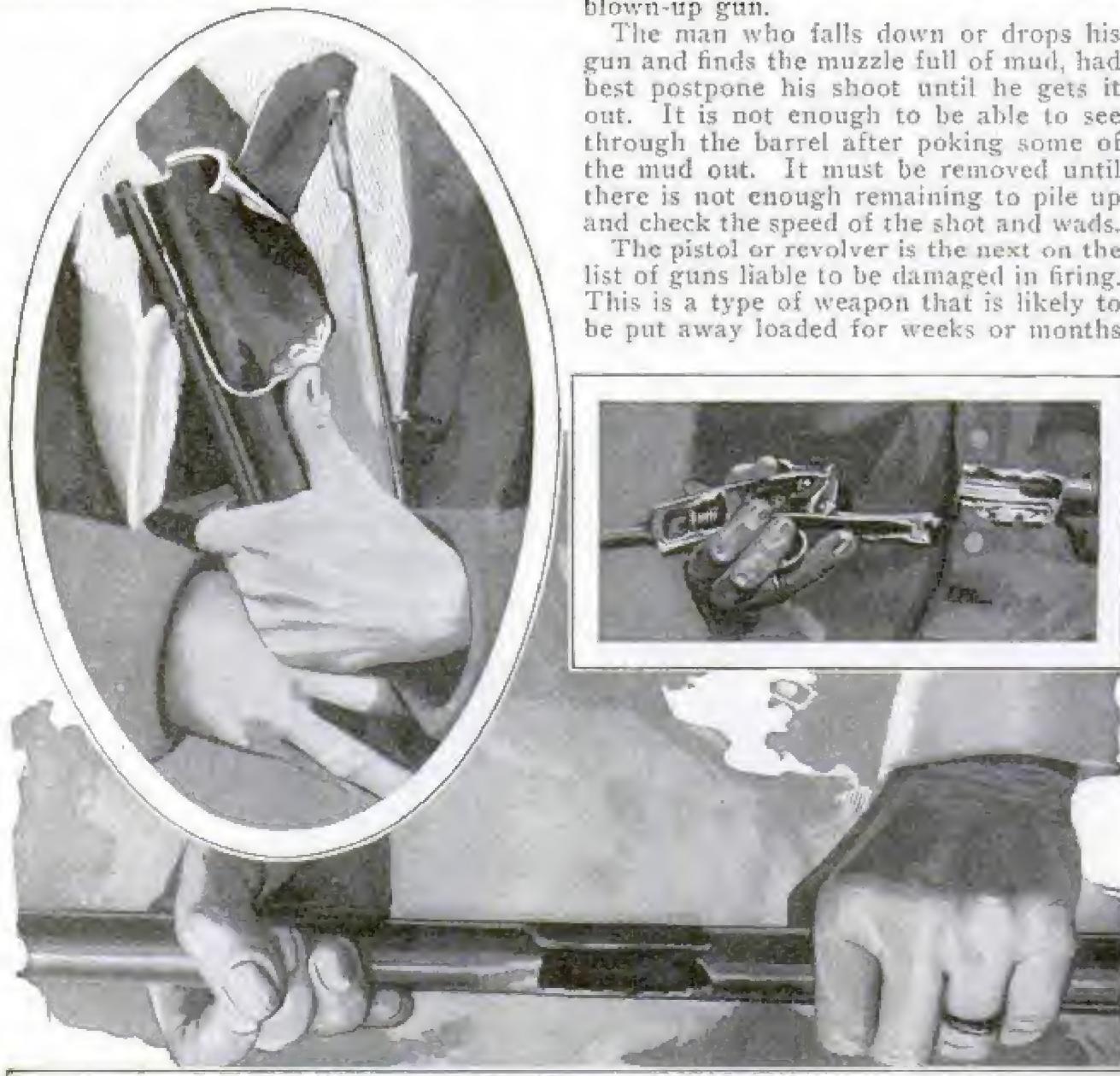
through the bore and remove the base wad.

Each year a certain number of shotguns are blown up through their owners' carelessness in loading their own ammunition. Two distinct sorts of powder are used in shotgun shells. One is "bulk," designed to use the same space in the shell as the older black powder and giving the same pressure and performance. This is loaded with a measure. The other is "dense," of which Ballistite and Infallible are examples. They take up very little room—about a third of that used by a charge of bulk giving the same pressure and speed to the shot. They are loaded by weight and are very powerful.

If the man who loads his own shells gets a can of dense powder and loads a lot of it into his shells by a bulk measure, he puts in roughly three times as much as he should, and the result is naturally a blown-up gun.

The man who falls down or drops his gun and finds the muzzle full of mud, had best postpone his shoot until he gets it out. It is not enough to be able to see through the barrel after poking some of the mud out. It must be removed until there is not enough remaining to pile up and check the speed of the shot and wads.

The pistol or revolver is the next on the list of guns liable to be damaged in firing. This is a type of weapon that is likely to be put away loaded for weeks or months



An Overload of Powder Blew Out the Chamber in the Oval; This Is the Only Way an Overload Damages a Shotgun; the Small and Large Pictures Show Shotguns Wrecked by Obstructions

at a time. Light oil, or some of the more subtle fluids used in compounds for cleaning and preserving guns, works in between the bullet and brass case, or at times around the primer in the base of the shell. Oil is fatal to smokeless powder and to primers.

The result is that when the gun is snapped, the powder usually fails entirely to burn, and a misfire results. The bullet is more likely to stick in the barrel. If the user does not notice this, he may fire a second shot, either driving out the first and bulging or splitting the barrel, or else piling up behind the first bullet.

The user of a revolver or pistol getting a miss, or of an automatic pistol that suddenly fails to operate and throw out the empty shell, should stop and make sure the bullet has left the barrel. A pistol put away loaded for weeks at a time should be filled with the special oil-proof ammunition or else the chamber and barrel should be wiped entirely dry of oil or nitro solvent, which wiping is likely to cause the gun to rust, from the resulting unprotected steel.

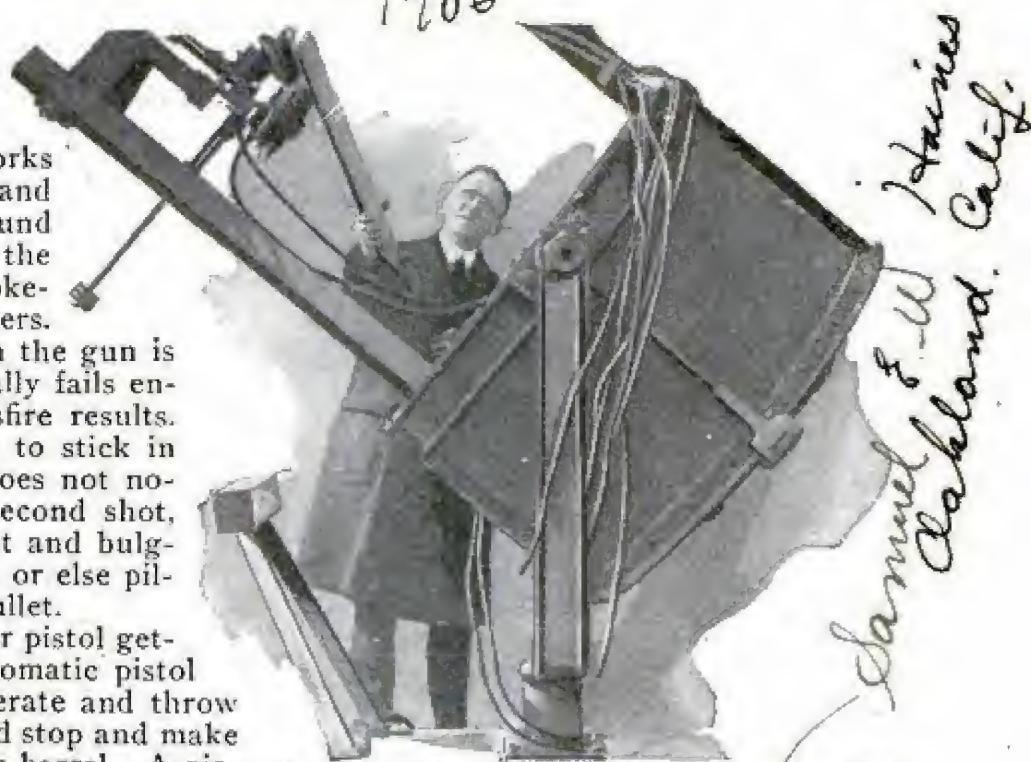
1761

ONE AMERICAN HOME IN FIVE HAS VACUUM CLEANER

Just how far electricity has been adapted to removing the drudgery of household tasks is indicated by the results of a nation-wide survey of the use of domestic electrical appliances. The figures, gathered by a large publishing firm, show that one American home in every eight has an electric washing machine, one in every five a vacuum cleaner and that more than 125,000 electric dishwashing machines are now in use, their sale during the last year having increased to more than double that of any other two preceding years. Approximately, 5,000,000 vacuum cleaners and 3,500,000 electric washers are now in use in the 26,000,000 homes of the United States, the survey showed. The value of these products for one recent year is reported to have exceeded \$20,000,000.



Making Out a Receipt for a Driver Who Has Paid His Fine in the "Cafeteria" Auto Court



Holding Stick of Wood in Path of Rays from Huge Searchlight to Test Their Heat

NEEDLES OF LIGHT PIERCE FOGS TO AID SHIPS AND PLANES

Rays from a powerful projecting searchlight devised by a California inventor are said to penetrate fogs like gigantic needles for the guidance of ships and airplanes. The effect is obtained by combining an arc light with a reflector which is said to concentrate the full light power it receives to a distant focal point. The heat is so intense that a piece of wood placed near the arc is quickly ignited.

"HELP YOURSELF" AUTO COURT /678 SAVES TRIAL DELAYS

Chicago autoists who break traffic rules are spared the delay that usually attends the appearance before a judge in a "cafeteria" court. The arresting policeman gives the offender a slip. If the violator pleads guilty, he goes to the special court where he is assessed a fine, and is permitted to go as soon as he has paid the amount. He is given a receipt for the transaction and a record is kept by card index.

My Edison C 130 E. 15th St.

James L. Davies
Oakland, Calif.

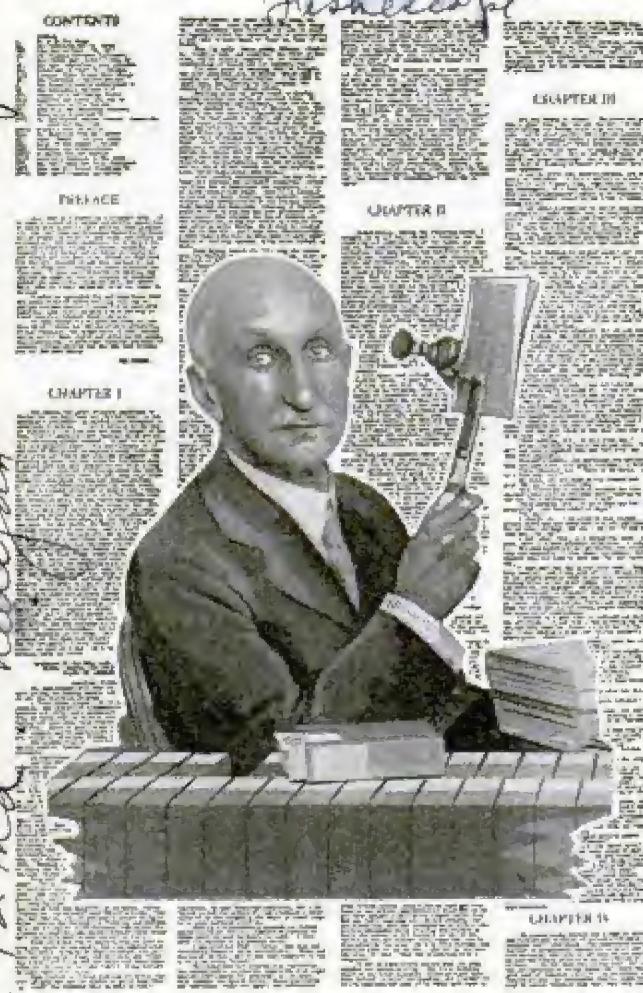
1937 Bradley A. Fiske, Retired

108

POPULAR MECHANICS

Stoneleigh Court Washington, D.C.
READING MACHINE TO AID EYES
AND REDUCE COST OF BOOKS

Bulky volumes can be condensed into small pamphlets and readers will be spared eye strain, it is asserted, by using a read-



Rear Admiral Fiske Holding His Reading Machine, and in the Background, a Sample of the Printing

ing machine invented by Rear Admiral Bradley A. Fiske, retired. Admiral Fiske has a number of successful inventions to his credit, including an electric gun-range finder, a torpedo plane, the naval telescope sight and a system for exploding torpedoes under ships, and believes that his reading apparatus will make eyeglasses unnecessary for the majority of readers who now use them. The instrument consists of a pair of small spring tongs with a lens for one eye and a shield for the other, together with a rack for holding the reading matter. This is produced directly from typewritten manuscript by a photographic process and is so small that it can scarcely be deciphered with the unaided eye, but is easily read under the lens. A sample prepared by the inventor illustrates

the size of the type. He had the entire first volume of Mark Twain's "Innocents Abroad," a book of 93,000 words, prepared into a small pamphlet of only thirteen pages, three and three-quarters by five and three-quarters inches with wide margins. Admiral Fiske declares that the apparatus shields the eyes from extraneous light, makes continual focusing unnecessary, keeps the printed matter at the correct distance from the eye and permits the eyes to retain their normal position in the head. One eye is just as good as two for reading, he asserts, as both are needed only in judging distance, and he points out that the finest work done by the human vision is usually performed with but one eye, as in telescopic and microscopic observations. Comparative tests showed that there was no loss of speed in using the machine, even though the reader was unfamiliar with it, and that there was less eye strain. Should the instrument become widely adopted, the inventor believes it would result in drastic changes in printing and book manufacture and would permit great saving of space in libraries. It is recommended that the system be first adapted to bulky reference works. One precaution is regarded as essential in using the machine: The page must be well illuminated as closing one eye shuts off about half the light. The instrument resembles a lorgnette.

PLANS TRANSATLANTIC TRIP
IN AIR-PROPELLER BOAT

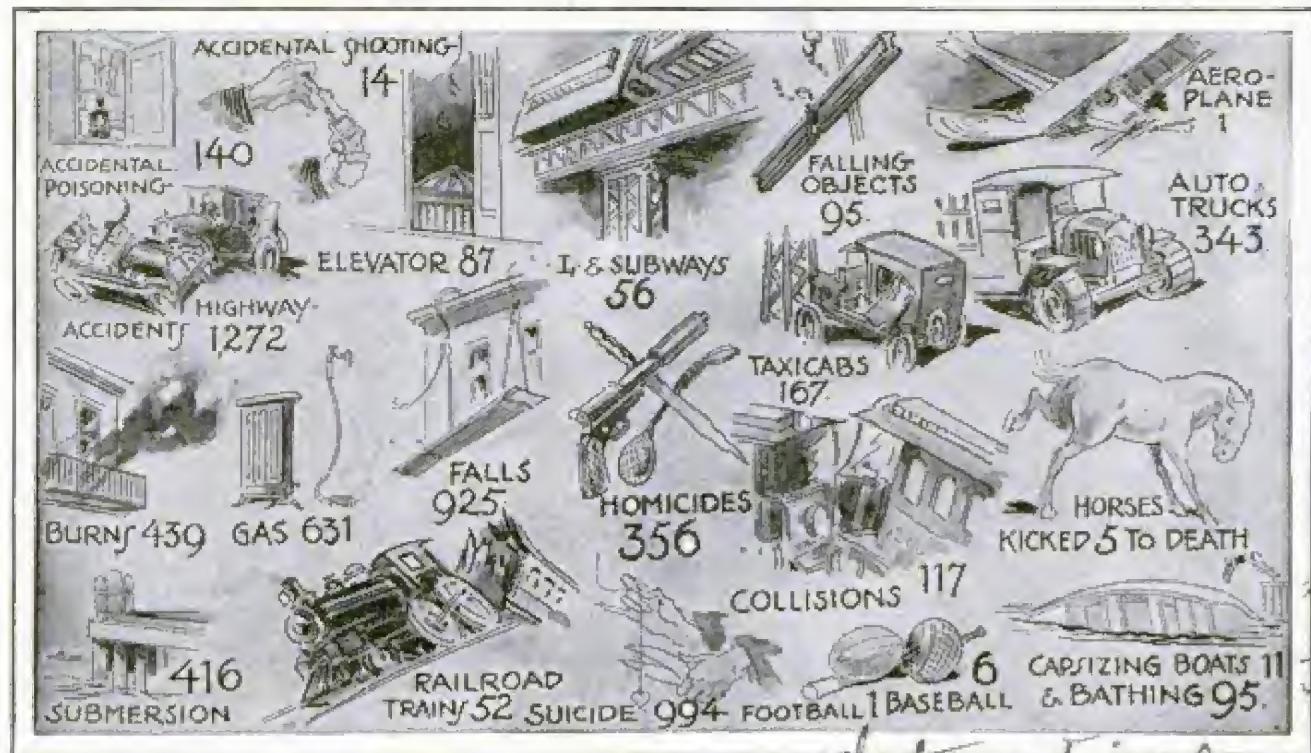
Motive power for a novel craft a Frenchman has built for a voyage across the Atlantic is supplied by a 180-horse-power motor turning an aeroplane propeller. The designer expects a speed of about ninety miles an hour in the open sea. He plans to leave from Marseilles and land at Pernambuco, Brazil, making a total distance of more than 6,000 miles.



Nearly Ready for the Transatlantic Voyage; Air-Driven Craft French Engineer Has Constructed for Long Journey

Al Isasenko.

HOW ACCIDENTS HAPPEN IS SHOWN IN PICTURES



New York's Violent-Death Record for 1925 at a Glance; the Figures and Drawings Were Prepared from Health-Department Reports and Covered the Principal Causes of Fatal Accidents

Picture diagrams of how 5,581 persons met with violent deaths in New York city, during 1925, showed that highway accidents claimed by far the largest number of victims with a total of 1,272. The few deaths from football and baseball, only seven for both sports, were a feature of the report, as was the number of fatalities due to kicks from horses, five persons being killed in that manner, apparently substantiating Maj. Schroeder's contention that the mule is more deadly than the airplane, which claimed but one victim in New York last year. The figures and diagrams were compiled according to statistics gathered by the department of health.

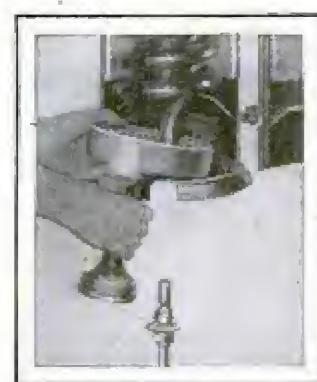
1520
WOOD WASTE PROVIDES POWER WHEN GROUND INTO FUEL

Wood refuse is now being used to turn the wheels of a large manufacturing plant. Rubbish that was formerly disposed of at a cost of more than \$1,800 a year is being burned under the boilers as the result of a new system. Wood scraps are passed through a grinding apparatus that removes all nails and reduces the material into fine particles. From this machine, it is conveyed by suction through a charger into a conveyor line which terminates at the power house. Here, a specially designed storage bunker with a capacity of 3,200 feet receives the refuse which is passed through a stoker into the furnace.

By means of a paddle-wheel feeder, the storage bunker is kept from catching fire and the wood is consumed while in suspension and burns with no smoke or ash.

1921
BURNER IN GAS WATER HEATER REMOVABLE FOR CLEANING

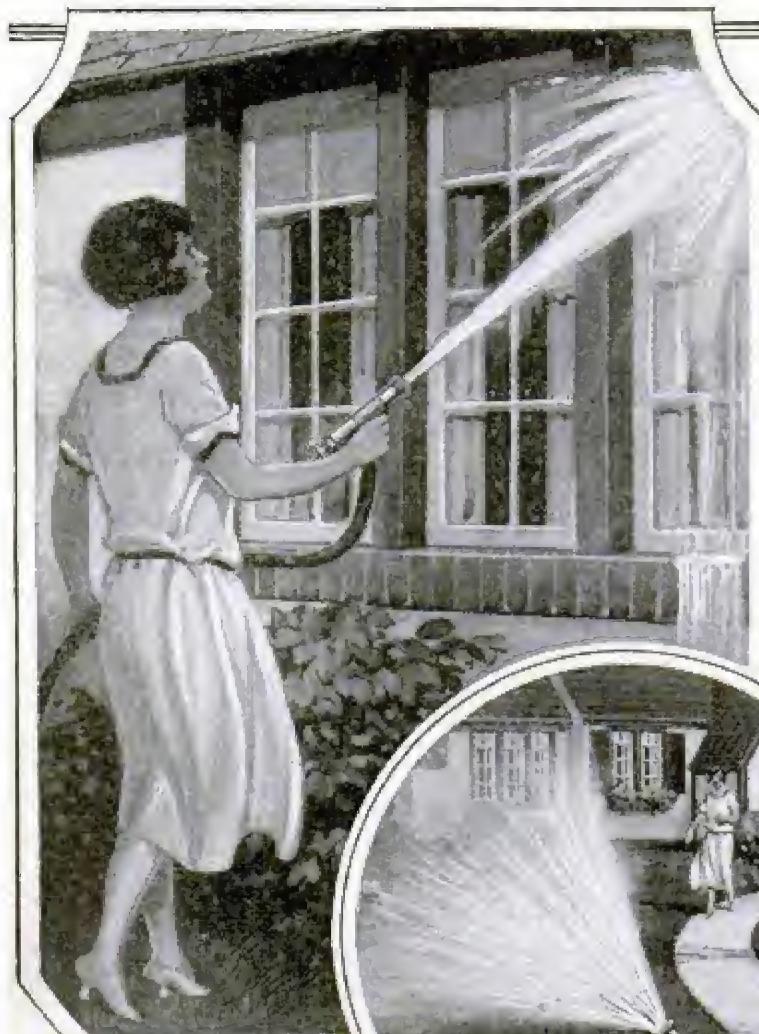
Cleaning a gas water heater now on the market has been simplified, for the burner and mixer may both be removed without using a wrench or breaking the gas connection. Particles of soot or scale that



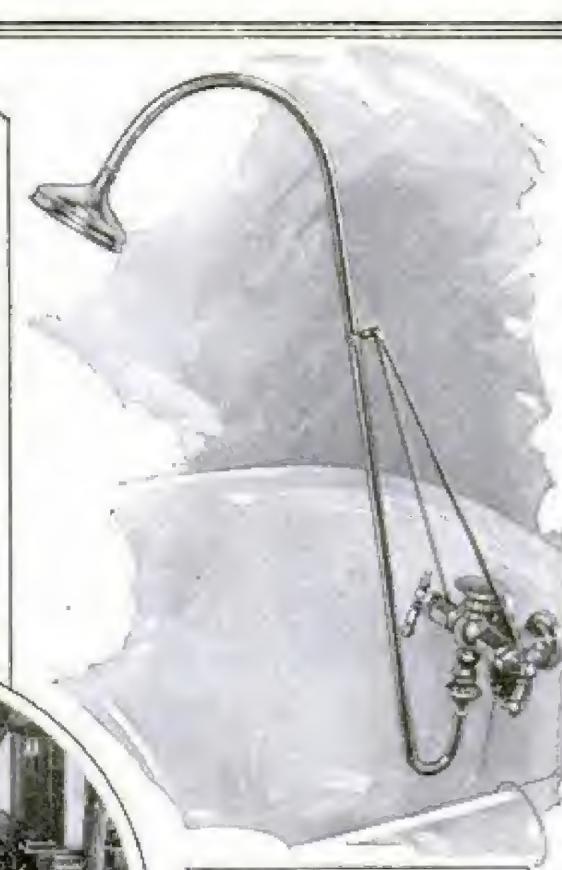
soon would clog the apertures are caught on a deflecting cone built into the burner so that they do not fall upon the gas ports, and the flame is prevented from impinging directly on the bottom coils or fitting. During a test, one of these heaters was burned continuously for 3,294 hours, about three times as long as the usual kind, before the coil sprang as much as a small leak. In this period, 395,316 gallons of water were heated and 221,085 cubic feet of gas consumed. Though the burner was not cleaned during the test, no trace of carbon monoxide was found in the flue gases.

Standard Gas Equipment Co., Inc.
1921
not sold separately

Time and Money-Saving Tools



Hose Nozzle with Sharp Spike Can Be Set in Lawn for Continued Sprinkling



Shower Attachment for Ordinary Faucet Is Quickly Adjusted or Removed; Below, a Useful Dressing Table with Two Wing Mirrors at the Sides Which Takes Up Little Space



Handle Is Attached on Broad Side of This Hair-brush to Cover More Hair



Notched Ruler Simplifies Fitting Skirts; It Is Used in Upright Position against Hem

for Woman's Workshop in Home



Soft Brooms Are Quickly Converted into Stiff Ones with This Sliding Guard; It Clamps the Straws Together, Preventing Them from Snapping Off While Sweeping. Preserves the Broom's Shape and Prolongs Its Usefulness; Is Especially Serviceable After Broom Has Been Dipped in Water

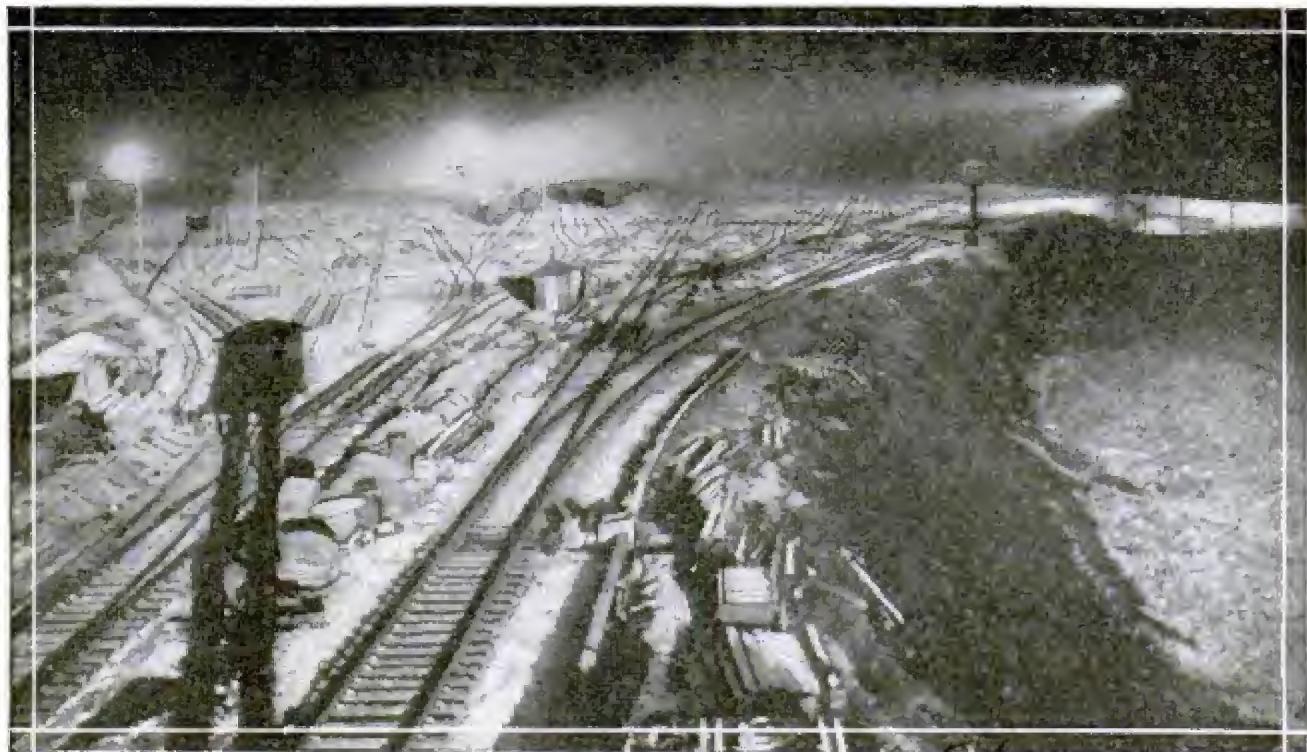


For Making Pies, Biscuits and Almost All Kinds of Pastry, Knife with Cutting Wires Eliminates Handling So That Dough Is Kept Cool and Texture Preserved; It Is Easily Cleaned in Hot Water

Nearly All the Kitchen against One Wall to Save Steps



Little Electric Stove on Wheels Has Oven and Grill on Top



Big Railroad Yards Brilliantly Illuminated with Powerful Searchlights to Aid Night Work; Forty-Five Reflectors Are Used

LIGHT SYSTEM IN FREIGHT YARD TURNS NIGHT INTO DAY

By means of forty-five electric searchlights which are turned on and off by automatic time switches, the three-and-one-half-mile freight terminal of the Illinois Central railroad near Chicago is brilliantly illuminated for night operations. The projectors are so set that glare is eliminated and equal distribution of light is achieved. There are 125 tracks and 11,500,000 square feet of ground in the area.

SHORT LENGTH PHONE BOOTHS CLEANER AND SAVE ROOM

Telephone booths being marketed by a California concern are short, circular compartments to be fastened

against the wall and are about two-thirds open at the bottom, to permit free circulation of air. The door closes quietly and automatically and as the person's body partly fills the space below the booth, outside noises do not greatly disturb him in using the phone. This arrangement takes up less space than the usual closet form of booth and it can be installed almost anywhere a wall is available.

WARSHIPS ARE MADE SECURE AGAINST BOMB, TORPEDO

By adding an external hull or shell and a third bottom to big battleships, and by strengthening the deck armor protecting machinery and other vital parts, engineers hope to make the dreadnaughts almost unsinkable. The work is to be done on six big ships of the United States fleet with an appropriation of \$18,000,000. By using materials from scrapped vessels, a saving of nearly \$300,000 will be effected on each ship, it is predicted. According to some naval experts, the battle of Jutland proved that the most formidable adversary of a modern fighting craft is not the airplane or the submarine but another ship of the same type as the war vessel itself with superior power of guns and greater speed. Experimental tests later showed that it took a number of bombs dropped from a plane to sink a motionless, helpless ship, whereas, in the Jutland engagement, three capital vessels were sent to the bottom in rapid succession.



Booth in Use and Open; It Fits
Snugly about Patron but Permits Ample Ventilation

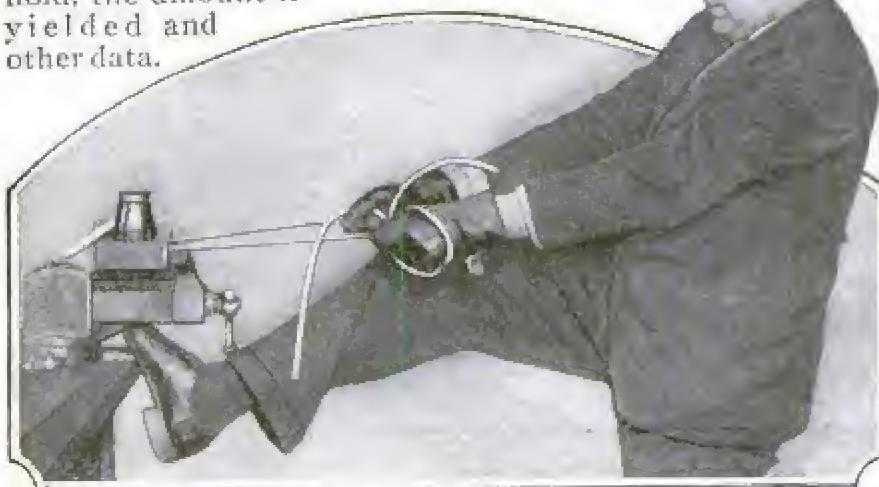
Jep-Lo-Phone Booth Co., Ledger 3/26/6

while moving at great speed after an exchange of a few salvos from the heavy guns. The "blister," or external hull, is said to reduce greatly the effects of a torpedo or bomb explosion. It is constructed of heavy plate steel and is subdivided into hundreds of chambers or compartments which are intended to "cushion" the detonation. It also serves another purpose. Should one side of the hull be torn open by a bomb or torpedo, the other side could be filled with water to prevent the vessel from listing and permit regaining the normal plane, unless the damage were too severe. The bulbous shape produced by the external hull is also expected to provide a more stable platform from which to fire heavy guns with greater accuracy. The dreadnaught "Arkansas" is now in dry dock, being equipped with this additional protective armor. To shield against vertically dropped bombs, virtually two complete decks of heavy steel have been laid over the original deck from bow to stern.

1535

RUBBER PROOF AGAINST ACIDS NEARLY STRONG AS STEEL

Tests conducted at the bureau of standards with a new rubber developed for commercial purposes show that it has almost the tensile strength of steel and is also proof against acids. To determine its qualities, it was put through severe stretching and other tests while records were kept of the number of pounds it would hold, the amount it yielded and other data.



One of the Strength Tests on the New Rubber; It Proved Nearly as Strong as Steel and Is Acid-Proof



Canopy and Realistic Tree Stump Built of Concrete

1578

CONCRETE ORNAMENTS IN PARK RIVAL NATURAL GROWTHS

Attractive little seats, tree trunks, and other objects used for decorating a park in a Texas city, have been molded of clay and cement with such realism that they deceive the eye and must be touched to determine their true nature, those who have seen them declare. Over a rough form or framework, the clay is applied and then topped with a cement coating for permanency. Colors are used to add to the naturalness of the effect, and such details as worm holes, frequently found in old wood, have not been overlooked. The decorations are executed by a young Mexican artist whom the park commissioner engaged to do the work after he had conceived the idea of using this special form of cement art to beautify the grounds.

The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession will be promptly furnished by addressing the Bureau.

Park Commissioner Ray Lambert
of San Antonio, Texas.

1450 **PLAYER CARRIES PIANO IN CAR TO KEEP IN PRACTICE**

While taking a long railroad journey, a musician kept in training with the aid of a small piano that fitted into the sleeping



Practicing Her Music Lessons While Traveling on Train; the Piano Fitted in Car

car. The instrument also permitted rehearsals, thus saving considerable time that would have been lost during the trip.

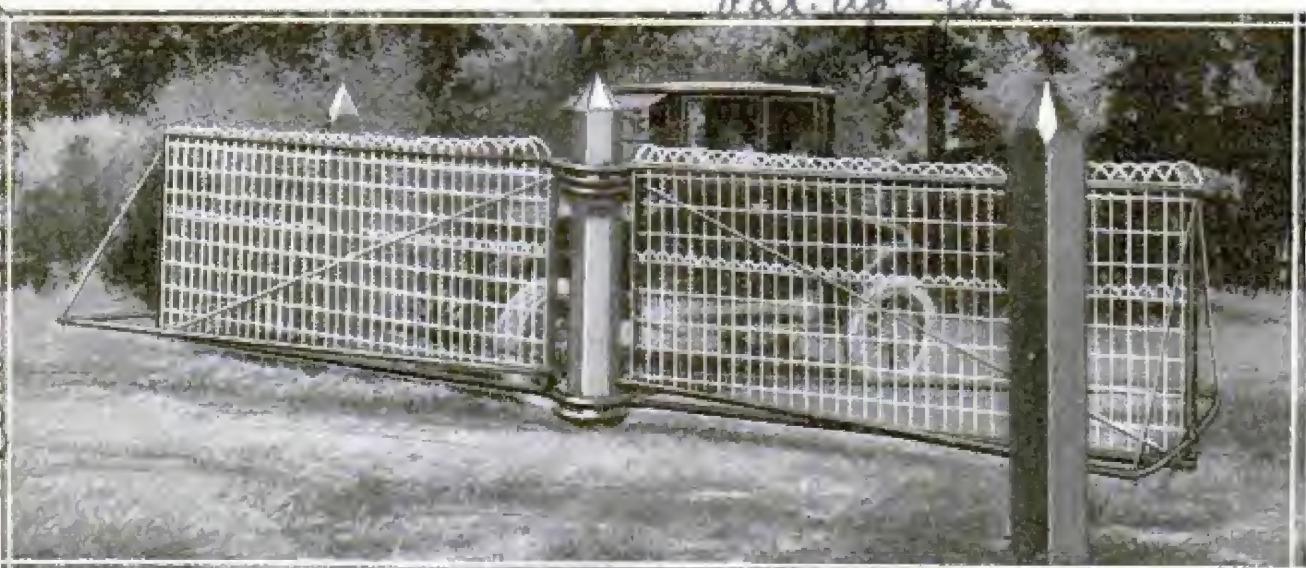
1604 **OIL IS LOCATED WITH WEIGHTS AND "BUGS" IN ROCKS**

Two interesting new methods have been developed for finding oil. One hinges on the fact that objects do not weigh the same in all localities and the other has arisen because certain families of minute sea animals died centuries ago and left their tiny shells in the rocks. In the first method, use is made of what is known as the torsion balance, an instrument invented a quarter of a century ago by a Hungarian

scientist. It is so delicate that it measures the direction and intensity of gravity at any point on the earth's surface and shows that things do not weigh the same at different places. This is partly attributed to the variation of the density or specific gravity of the rocks below the surface. Objects above rocks of great density weigh more than they do above those of smaller specific gravity. The balance thus affords a clue as to the character of the material below the top, leading sometimes to the discovery of formations of light specific gravity, such as salt domes where oil frequently is found. The "bugs," or foraminifera, have been classified by scientists so that the strata where they are found can be identified. Geology teaches at about what depths these strata should lie. If they are found at widely different levels, the prospector knows that a disturbance has occurred, and that there is probably a fault in the earth's crust, a sign to be on the lookout for oil.

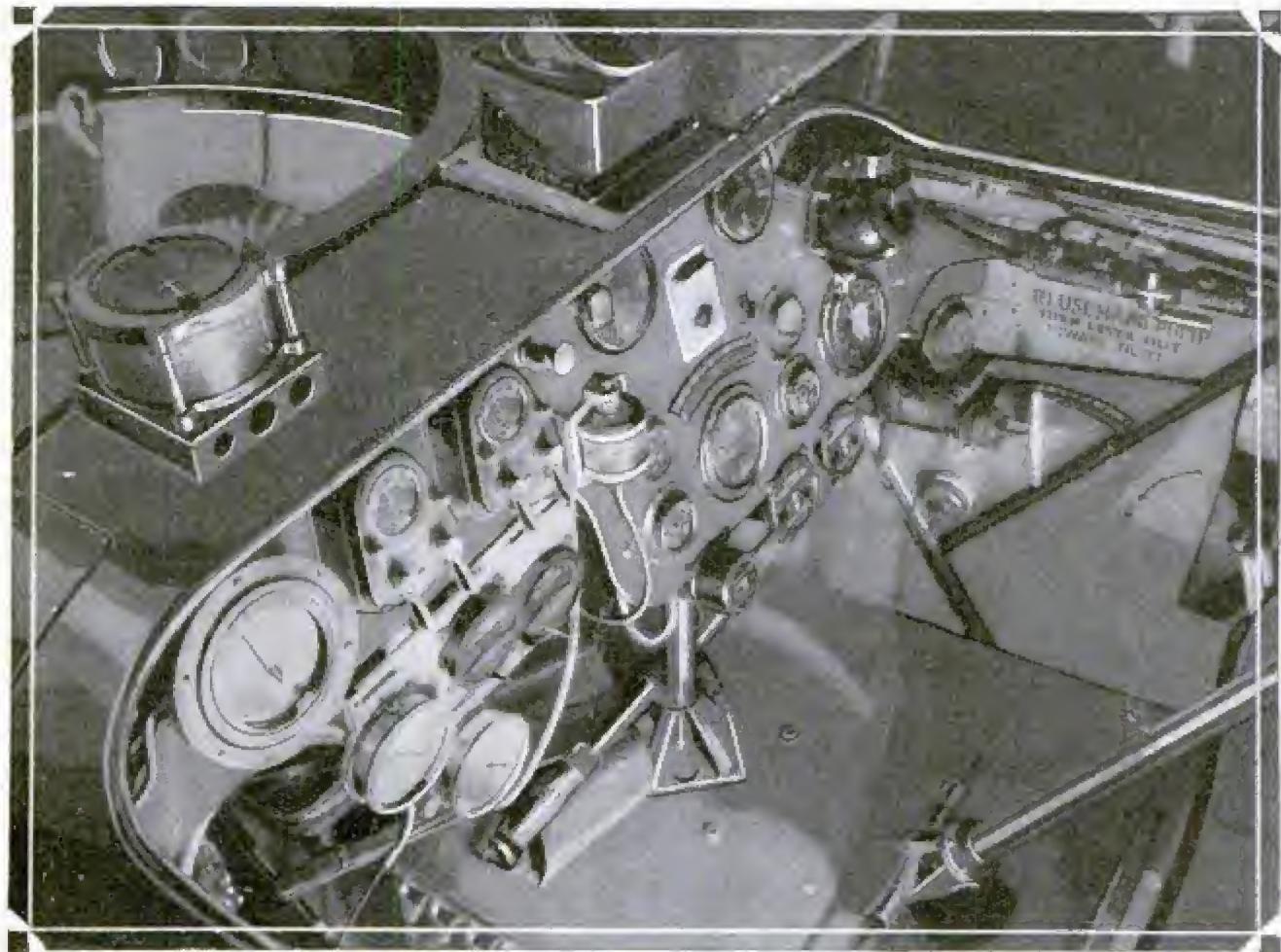
1441 **REVOLVING GATE ON PIVOT POST OPENED BY AUTOMOBILE**

Doing away with the inconvenience of getting out of the car, a revolving gate now on the market is opened when the automobile is bumped gently against it and swings shut again when the vehicle passes through. It is solidly constructed of wrought-iron pipe and wire or wood, and rides on circular cams attached to the pivot post in the center. When pushed, the gate rises on the uphill slope of the cams. Past the center, it encounters the downward slope and so closes by gravity. Sagging is eliminated and it will not open under the pressure of heavy winds.



As Auto Is Pushed against Revolving Gate, Central Portion of Frame Rides on a Circular Cam Attached to Pivot Post; Gate Swings Halfway Around and Is Closed When It Stops

*Merrill Automatic Gate Co.
326 Central Ave. - 162-1*



Something to Keep the Airplane Pilot's Eyes off the Scenery; the Instrument Panel of an Army Bomber, with a Few Experimental Devices Added to the Regular Equipment

Guiding the Lost Flyer Back Home

Better Instruments Solve Problems of Night and Fog Flying, Make Reading Easier and Remove Danger in Event of a Crash

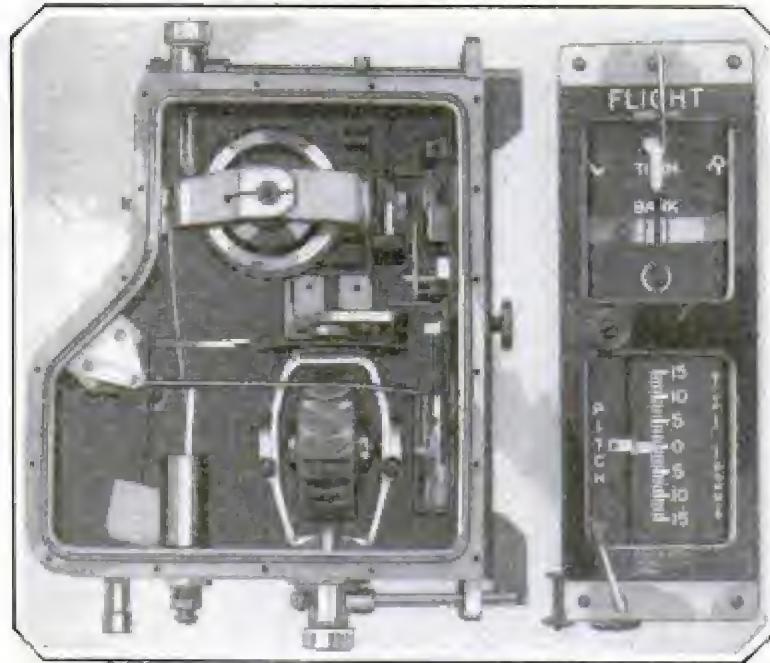
By E. F. BACON, *30 Laur St, Dayton, O.*

THE development of instruments as an aid to aerial navigation has closely paralleled that of the airplane itself. The Wright brothers, in their early attempts to fly, soon realized that successful flight could be performed only by using mechanical devices to aid their senses. Their experiments along this line soon resulted in the birth of the first aeronautical instrument which was merely a strip of white cloth tied to one of the struts. During flight this strip was carried straight back by the rush of air and the angle it made with the strut showed the inclination of the plane with respect to the air.

As the airplane developed, it became necessary to use more instruments to obtain the best performance. The engine, being a vital part of the craft and yet subject to frequent failure, required almost

constant supervision. This supervision could not be of the hit-or-miss type, because a dangerous symptom, such as a spurt of boiling water from the radiator or a violent knock, not only indicated that damage had been done but that there was no time to search for a landing field. It naturally followed that the engines were equipped with oil and fuel-pressure gauges and later with a thermometer and a tachometer. These instruments gave the pilot sufficient warning of trouble so that he was enabled either to correct the condition or search for a landing field. In addition to their use as a warning the instruments made possible more efficient use of the engine by assisting in obtaining and holding the best temperature and speed conditions.

In some respects the navigation of aircraft does not present the problems that

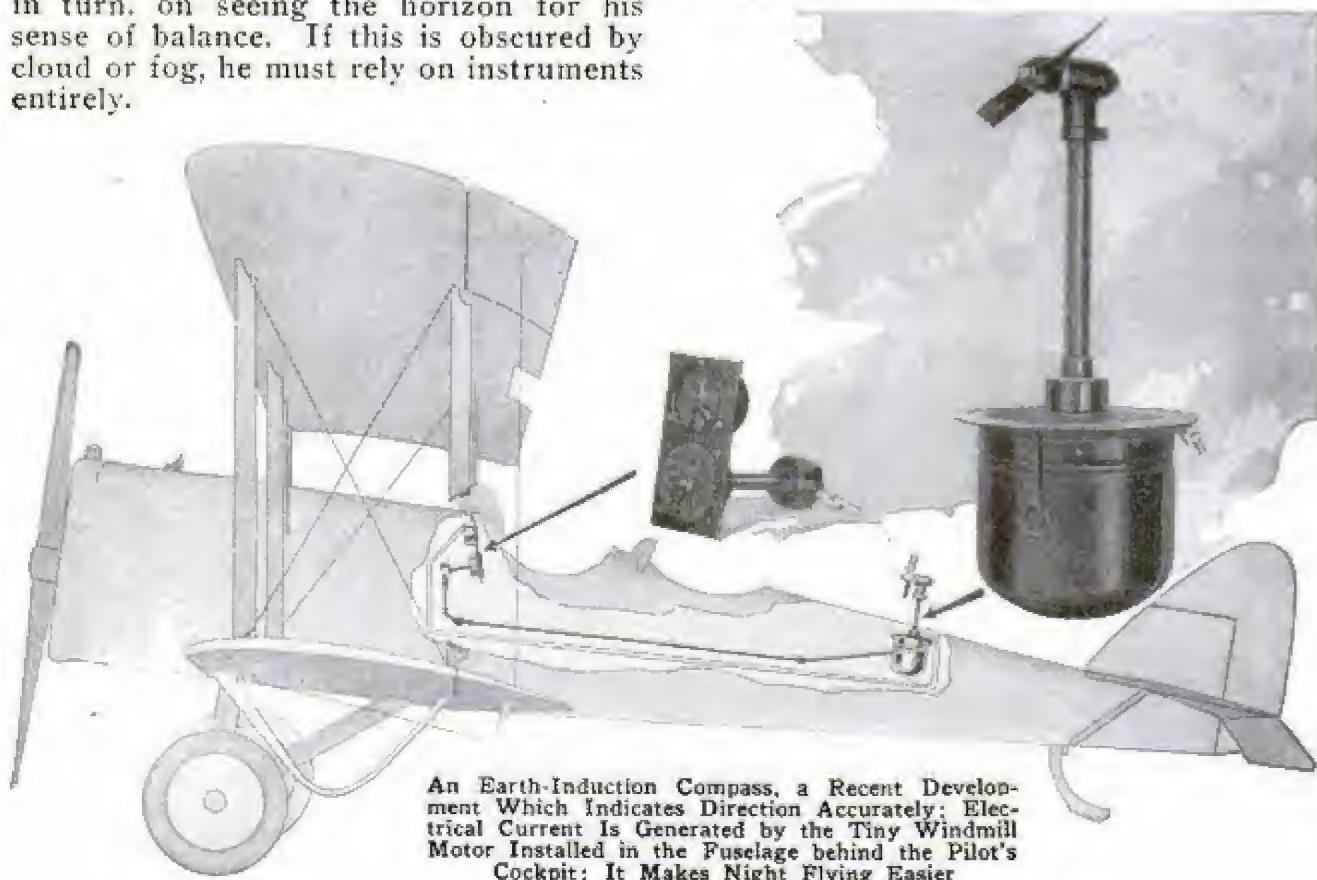


An Aid in Fog, the Flight Indicator, Which Tells Whether the Plane Turns or Pitches, and Replaces Horizon and Landmarks

marine navigation does, but in others, the difficulties are greater. Flying, with good visibility, over land where an abundance of landmarks affords a constant check on the position of the plane is fairly simple, but over water, barren lands, or during darkness, fog or rain, the obstacles are almost insurmountable. The winds that carry aircraft off their course vary in direction and value from hour to hour, and even change with altitude. The airplane depends on the pilot for balance, and he, in turn, on seeing the horizon for his sense of balance. If this is obscured by cloud or fog, he must rely on instruments entirely.

Because of the nature of its mission, military aviation will always present more problems than civil. Well lighted airways, radio beacons, familiar country with frequent landing fields, good weather service, and the postponement of flights on the worst days, will rid civil aviation of most of the delays and hazards. The military aviator, however, must be prepared and equipped to navigate over strange and hostile country, at night and under all conditions. He must be capable of flying several hundred miles to sea on scouting and bombing trips and return to his base. For these reasons the military airplane equipment will have to be more complete than that carried on the commercial type.

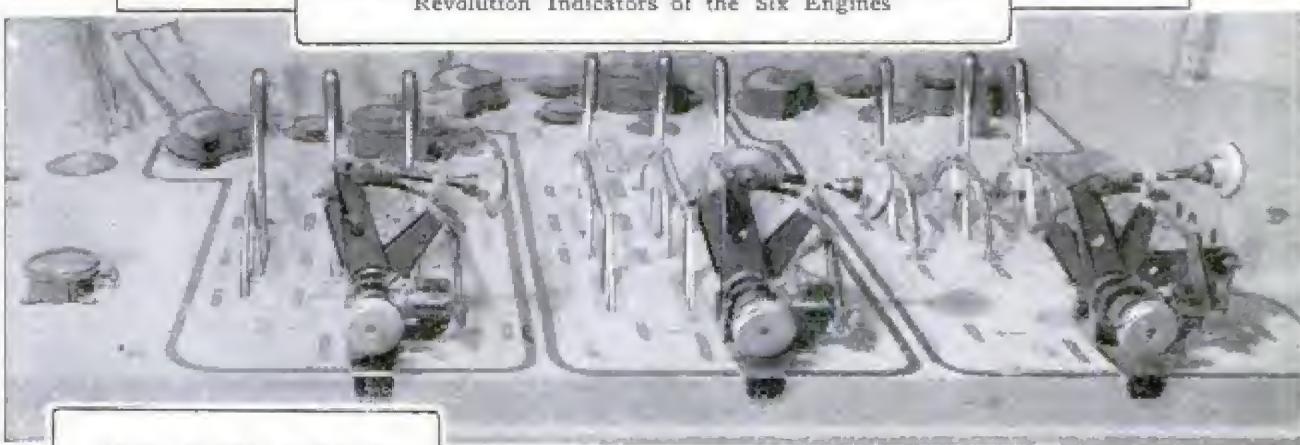
The modern instrument board is divided approximately into halves, the left side being used for the group of instruments concerning the engine, and the right side for the instruments used in navigating the plane. The engine instruments include the oil and fuel-pressure gauges, water thermometer, tachometer, ammeter and ignition switches. If the plane has a supercharged engine, there will also be an instrument to tell the pressures at which the engine is being supercharged. The navigation instruments in-



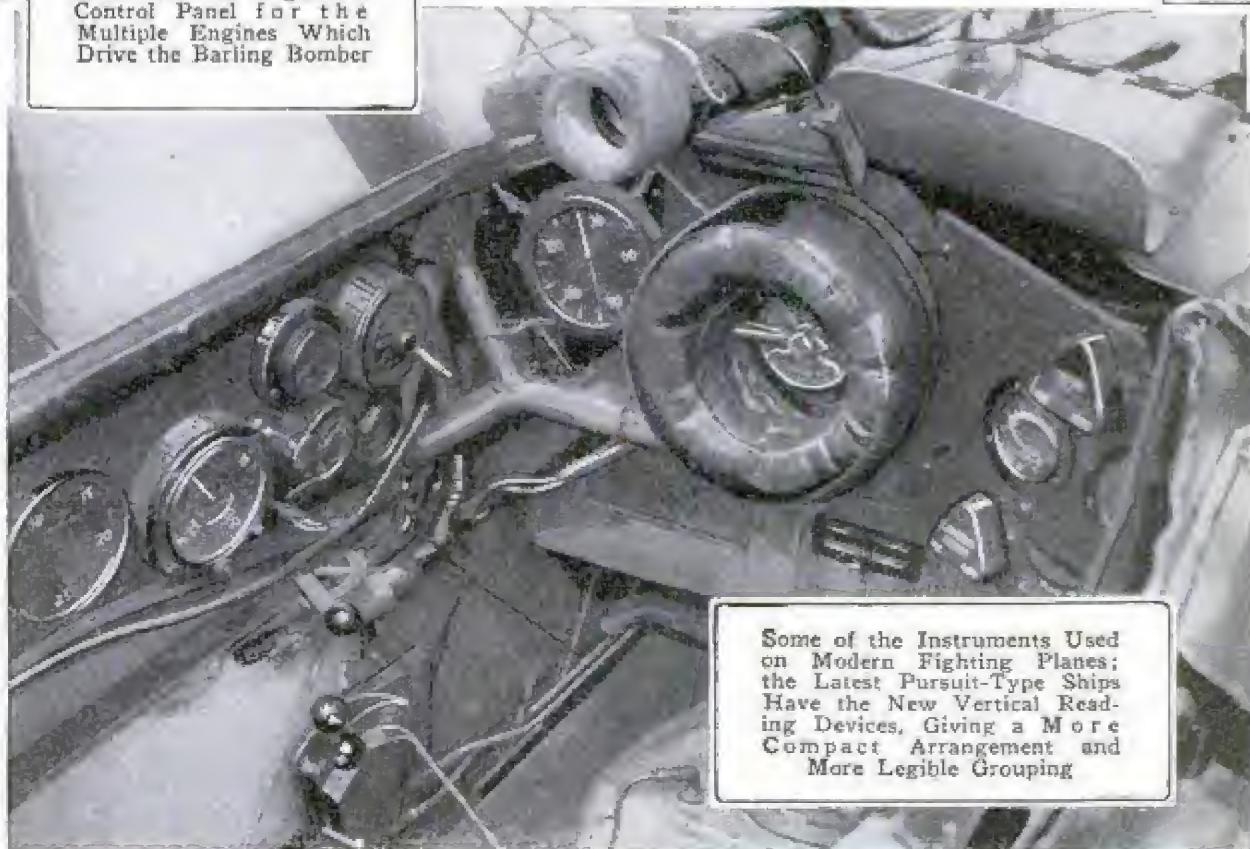
An Earth-Induction Compass, a Recent Development Which Indicates Direction Accurately; Electrical Current Is Generated by the Tiny Windmill Motor Installed in the Fuselage behind the Pilot's Cockpit; It Makes Night Flying Easier



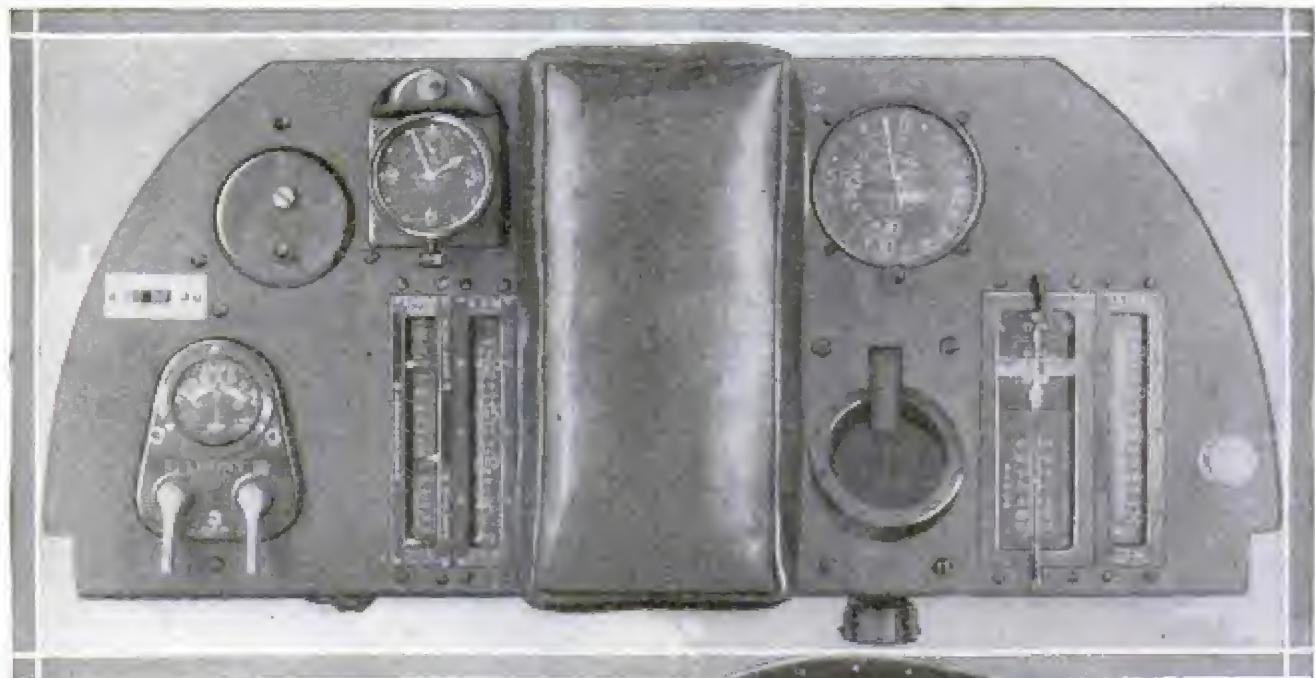
The Instrument Board of the World's Largest Airplane, the Barling Bomber; the Six Similar Recorders Are the Revolution Indicators of the Six Engines



Above Is the Engineer's Control Panel for the Multiple Engines Which Drive the Barling Bomber



Some of the Instruments Used on Modern Fighting Planes; the Latest Pursuit-Type Ships Have the New Vertical Reading Devices, Giving a More Compact Arrangement and More Legible Grouping



Above, the Latest-Type Instrument Board Designed for Regular Airways Service; the Flush-Type Instruments and the Leather-Covered Pad Minimize the Danger to the Pilot of Being Cut in the Event of a Crash Throwing Him Forward against the Panel; at the Right Is One of the Instrument Boards Developed during the War, with Recorders Scattered Around in Haphazard Fashion and Extending Out from the Board So as to Imperil the Flyer in a Fall



clude the air-speed meter, compass, altimeter, clock and flight indicator or turn indicator. Under normal weather conditions the pilot does not attempt to observe these instruments all the time, but glances at them occasionally to reassure himself that the engine is functioning properly and that he is on the right course.

The pressure gauges and the thermometer are similar in construction to those used on the better motor cars. The tachometer contains a form of watch escapement and counts the actual number of engine-shaft revolutions made in a certain time. This type of tachometer is free from the troubles commonly experienced in the centrifugal and magnetic types. The air-speed meter works on the following principle: If a tube is placed with its open end pointing ahead of the airplane, the air striking it will build up a pressure; when this tube is connected to a suitable gauge the speed of the airplane can be read off directly in miles per hour.

The latest form of airplane compass is the so-called earth-inductor compass in which the current generated in a coil rotated in the earth's magnetic field is used

to indicate the direction of the magnetic north. When flying in clouds, the pilot also must have some means of telling when he is flying a straight and level course. When no horizon is visible, one wing may drop or the airplane start a slow turn without the knowledge of the pilot. The rate of turn will gradually increase until the plane drops off in a spin. To aid him in such cases the pilot has the flight indicator. The actuating element of the instrument is a small air-driven gyroscope, which deflects against a spring when the plane turns. This deflection is communicated to a pointer which indicates the direction.

The lateral inclinometer consists of a steel ball rolling in a curved glass tube. When the airplane is not turning this indicates the lateral balance of the craft. If a wing drops a little, the ball will roll to the low end of the tube. The fore-and-aft inclinometer indicates the pitch of the plane. The pendulum in this instrument is controlled by a small gyro which only acts when there are accelerations present which would make a simple pendulum indicate incorrectly.

SEARCHLIGHTS FOR NIGHT WORK IN DIAMOND MINE 1487

From fourteen huts on the rim of a deep craterlike hole in South Africa, shafts of light stream out every night to illuminate the diggings below where natives are toiling in the clay for diamonds. This lighting system has been installed at the Premier mines, where the famous Cullinan diamond was discovered, and consists of batteries of 1,500 and 2,000-watt lamps with filaments of the so-called "monoplane" type. In front of each lamp is a 5½-inch spherical mirror and each projector has a sixteen-inch parabolic mirror. Current for the lighting is distributed by four substations from a large generating plant. The lights have a range of from 900 to 1,600 feet for satisfactory illumination, and are considered a great advance over the old type of arc searchlights, which were constantly being damaged by the blasting operations. It is estimated that, at the end of 1924, the mines here had produced 23,500,000 carats of diamonds. The area is the "pipe" or vent of a former volcano, oval in shape, about 2,000 feet long and 1,500 feet wide. This entire section of some seventy-eight acres is being dug out and dumped on the surface of the land near by.

TEST HEARING IN MOVING CARS TO STUDY DEAFNESS 1610

Persons partly deaf submitted to hearing tests on moving street cars in New York city not long ago, while physicians carefully recorded the results. The experiment was made in part to determine if the constant noise of the car had a beneficial effect on the subjects' sense of hearing. Those who suffer from this trouble often say that they can hear better on cars or other places where there is noise than in quiet rooms. This has been explained on the ground that, a steady noise does stimulate the auditory nerves in some persons to a certain degree, and when there is a disturbance, persons speaking to a deaf companion naturally raise their voices to a higher pitch than when the surroundings are quiet.



Like Short Stilts but with Spring Plungers, These Walkers Give Children Healthful Exercise

JUMPER WITH SPRING PLUNGER GIVES CHILDREN EXERCISE

Children are afforded healthful exercise and amusement with a pair of spring-plunger jumpers now on the market. They are easily put on and a boy can travel from ten to fifteen miles an hour with them, the manufacturers claim. The plunger is but four and one-half inches from the ground and is fitted with a strong spring, permitting long leaps. The jumpers are made in adjustable sizes for boys from six to sixteen years.



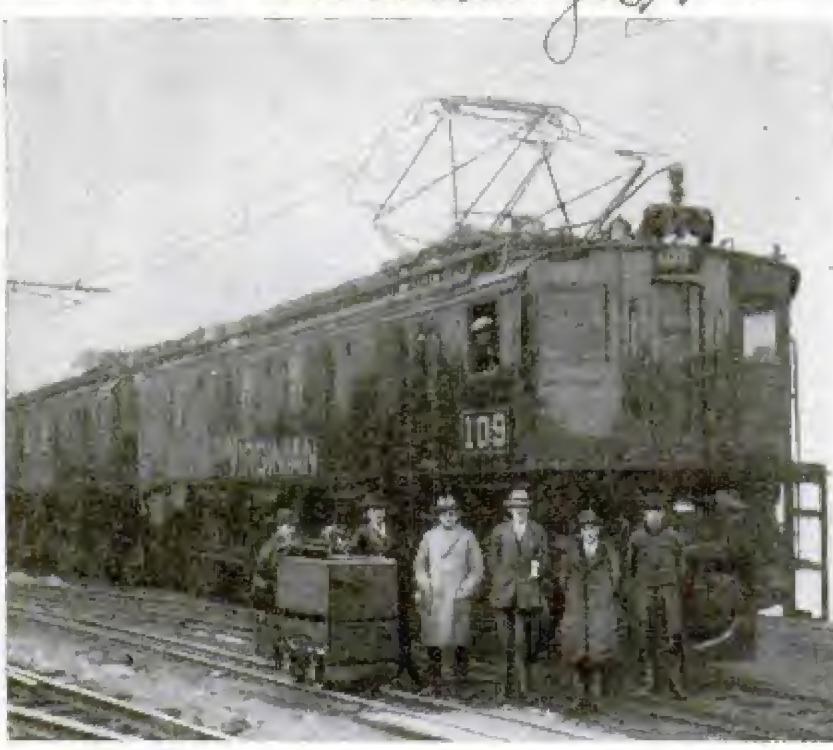
Measuring Acuity of Hearing in Moving Car; Phonograph at Right Was Also Used in the Test

H. M. Slalans Dr. E. L. LaCrosse and
Dr. Paul V. Wenslow 580 Park Ave

Charles Hamilton

May 1925 Jumper Co.
1593 Cedar Bluff
Mo.

East Pittsburgh, Pa.



Extremes in Electric Locomotives; the Pygmy in the Foreground Is Run by Storage Batteries in Mining Work

CONTRAST IN ELECTRIC ENGINES IS PROOF OF PROGRESS

Visitors in the yards of an eastern manufacturing company saw an interesting contrast in motive-power units recently when the midget and the giant of the electric-locomotive world were set side by side. The former, a "mechanical mule" used in various mining operations, is only forty-one and one-half inches long with a capacity of but four and one-half horsepower, while its larger brother is 152 feet in length and develops 10,000 horsepower. It is to be used for hauling a loaded train nearly two miles long over a steep grade. The dwarf is run by storage batteries.

SEED GROWTH AIDED BY ACID BATH

As a result of interesting laboratory experiments performed by a Minneapolis woman on the seeds of wild flowers, thinning woodlands may be replenished of their fast disappearing stocks of natural blooming plants and the slogan "Don't Pick" may

be replaced by the phrase, "Plant and Pick All You Want." It now appears that wild



Front and Rear of Rescue Harness

flowers can be grown by artificial cultivation. So successful have been the first experiments that even the wild hollyhock, one of the hardest of all to propagate, has been made to put forth tiny green leaves in the laboratory. One of the difficulties encountered in making these seeds sprout is that they have hard coats. The experimenter solved the problem by removing the coverings. This was easy with the larger seeds but not with those of microscopic size. However, it was found that by soaking them in acid, they were liberated from their hard coating. The hollyhock seeds were treated for two hours in concentrated sulphuric acid.

The artificial method may be even more efficient than nature, for it is estimated that, under normal conditions, only about one out of every 10,000,000 seeds of the wild flowers germinates. Several varieties were found to be especially easy to grow. These included the evening primrose, the yucca, wild teasel and the sullivantia, a saxifrage that grows in limestone ledges.

LIFE HARNESS FOR LINEMEN / 643 AIDS IN RESCUES

Linemen who suffer electric shock while at work can be lowered to the ground for resuscitation by means of a special harness that has been devised

in Germany. It is worn under the shoulders and is so arranged that the victim can easily be let down in a perpendicular position. As in drowning, artificial respiration methods are often effective in reviving a person who has suffered an electric shock, and linemen are sometimes lost simply because of

delays in getting them to the ground quickly where aid may be given them.

Working under fellowship from Weld, & lower Reservation, Mrs. Oscar Muller

Building a Simple Tube Tester

By HARRY P. LETTON

AN efficient and very simple tube tester can be built from odds and ends about the average radio experimenter's workbench. The main item of expense is the milliammeter. A good instrument can be obtained for



Tube Tester in Use; Detailed View of Front Panel Shown in Insert

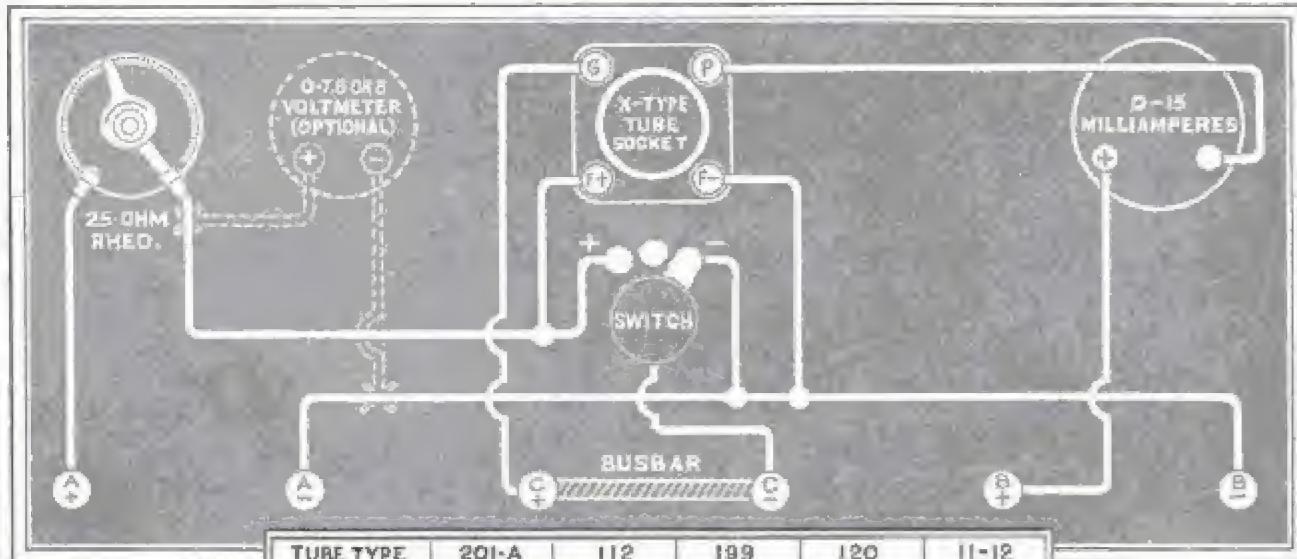
about \$7. The other parts required are very simple and inexpensive; a 25-ohm rheostat, tube socket of the new X-type, six binding posts, switch lever and three contact points with stops. The panel can be of any insulating material, the size of this panel depending on the size of the case used. The case used in the model was an ordinary cigar box, $2\frac{1}{4}$ in. deep and of the size ordinarily used for 50 cigars. The lid was removed and the box scraped and sanded to a smooth surface; it was then stained a mahogany color, and varnished. It may be finished to suit the individual builder. The drilling template for the panel is given; the exact size of the holes will depend on the type of parts used.

The instruments are then mounted on the panel in the positions shown in the front-view photo of the finished instrument. The X-type tube socket used in the model was of the spring-suspended variety; the upper part to which the terminal connections are fastened was removed from the base, and mounted directly on the panel. However, any type

of X-socket can be used and mounted in the usual manner. Drilling the hole for the milliammeter is not so easy, but a circle, $2\frac{1}{8}$ in. in diameter, can be scribed on the panel with a

pair of dividers; small holes are then drilled around this circle close enough together so that the inner piece will fall out. A half-round file is then used to smooth off the edges, and the milliammeter fitted in place. The switch lever and contact points are then mounted as shown, and the outside contact points marked positive and negative exactly as shown on the template. The center point is dead. Binding posts with engraved tops can be obtained so that it will not be necessary to mark their positions on the panel.

The tester is now ready for wiring. The wiring diagram shows each instrument and the wires running to them will be found above the chart. This wiring is shown just as you would see it if the panel was transparent; No. 14 round, tinned-copper busbar wire is used for the circuit. All connections are soldered to lugs mounted on the terminals of the various instruments. The voltmeter, shown in the dotted lines, is optional and may be omitted to keep down the cost. It is important if exact tests on the rated filament voltage of the tubes are required, but for ordinary testing, the rheostat can be turned up to the usual tube brilliancy, or saturation point, as shown on the milliammeter when the switch lever is placed on the negative contact point. The bus-



bar shown between the C-positive and C-negative posts is merely a piece of wire shorting these posts when no C-battery is used. A C-battery is necessary for some tubes, as shown on the chart, when checked with certain B-battery voltages. It is a good idea to check the tubes under the same battery conditions existing in the set in which they are used; however, a 45-volt B-battery and A-battery of suitable size for the tubes to be checked are sufficient for ordinary tests with tubes of the 201A and 199-types.

The operation of a vacuum tube is dependent upon the controlling effect of changes in grid potential on the plate current. The filament may light as usual, yet certain defects may exist in the tube. The controlling effect of the grid may also be absent, and there may be internal shorts in the tube. If a tube is normal, a definite amount of current will flow from the B-battery to the tube when the tube is turned up to normal voltage. When the grid potential is changed a given amount, the plate current should change to another value, and the relative value of this change largely determines the value of the tube. When testing tubes with this instrument,

TUBE TYPE		201-A	112	199	120	11-12
FIL. VOLTS		5	5	3	3	1.1
"B" VOLTS	SWITCH	MILLIAMMETER READINGS				
22 $\frac{1}{2}$	-	0.3-0.5	0.7-1.3	0.2-0.4	0.9-1.3	0.2-0.4
	+	1.7-2.3	5.2-7.3	0.7-1.1	1.7-2.3	0.4-0.8
	DIFF.	1.4-1.8	4.5-6.0	0.5-0.7	0.8-1.0	0.2-0.4
45	-	1.3-1.6	3.0-3.6	1.2-1.5	3.4-4.0	1.2-1.5
	+	4.3-5.2	10.0-12.2	2.0-2.7	4.5-5.5	1.5-2.0
	DIFF.	3.0-3.6	7.0-8.6	0.8-1.2	1.1-1.5	0.3-0.5
67 $\frac{1}{2}$	-	2.6-3.8	5.4-6.7	2.7-3.0	7.2-8.0	2.5-3.8
	+	6.0-7.8	13.8-16.5	3.7-4.4	8.4-9.7	2.8-4.3
	DIFF.	3.4-4.0	8.4-9.8	1.0-1.4	1.2-1.7	0.3-0.5
90	C BAT.	NONE	6.0-VOLT	4.5-VOLT	7.5-VOLT	4.5-VOLT
	-	4.4-6.5	2.0-3.0	2.5-3.0	7.5-8.5	2.3-2.8
	+	8.2-11.1	5.6-8.0	3.7-4.7	8.8-10.1	2.8-3.3
	DIFF.	3.8-4.6	3.6-5.0	1.2-1.7	1.1-1.6	0.3-0.5
112 $\frac{1}{2}$	C BAT.	4.5-VOLT	7.5-VOLT	—	15.0-VOLT	—
	-	3.6-4.8	2.2-3.2	—	7.3-8.0	—
	+	9.0-10.5	6.7-8.7	—	8.5-9.7	—
	DIFF.	5.4-5.7	4.5-5.5	—	1.2-1.7	—
135	C BAT.	—	9.0-VOLT	—	22.5-VOLT	—
	-	—	5.0-6.0	—	6.5-7.5	—
	+	—	12.2-14.5	—	7.9-9.3	—
	DIFF.	—	7.2-8.5	—	1.4-1.8	—

TUBE-TESTER CHART

connect the proper A and B-batteries to the binding posts, being careful to observe the correct connections. If no C-battery is specified on the chart, the C-battery binding posts should be left connected with the busbar wire. If a C-battery is specified, take out this short-circuiting connection and put in the proper C-battery, observing the correct polarity. The C-battery enables the tester to be used on a greater range of voltages, and with the newer type of tubes. Turn the rheostat to the off point, and place the tube to be tested in the socket. The X-type socket will have two large holes for the filament prongs of the tube.

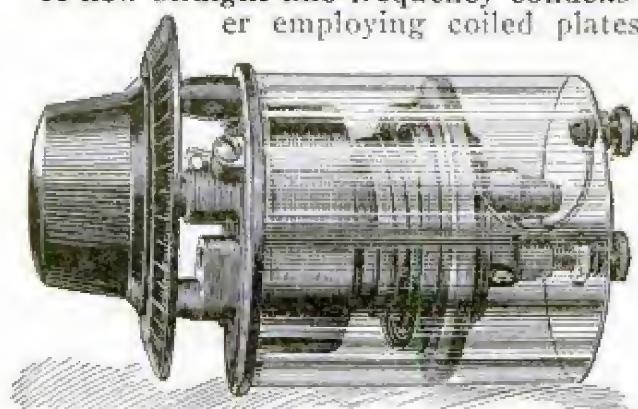
If the tube being tested is of the old type having the small prongs, determine which are the filament prongs before putting the tube in the socket. The metal pin on the side of the tube base is usually on the grid and plate side of the tube. If in doubt, place the tube in an extra socket to determine the position of the terminals and mark them on the base of the tube. With the old type of 199-tube, it will be necessary to use an adapter. Place the switch lever on the negative contact point and turn up the rheostat to the normal

voltage, or point of saturation, as shown by the milliammeter reading. Take this reading, which indicates the value of the plate current in milliamperes when the grid is connected to the negative end of the filament. Then switch the lever over to the positive contact. This shifts the grid from the negative to the positive filament, and the plate current will rise to another value. The greater this change in plate current for a given grid-value change, the higher the mutual conductance of the tube, and the better it is. These readings may be considerably higher than those shown in the chart; if so, good, but they should not be lower. Some tubes will be found to give much higher plate-changes than others.

If a tube has its plate shorted to the grid or the filament, a relatively heavy current will flow in the plate milliammeter, and the pointer will swing over to maximum very quickly. Should this occur, remove the tube at once to prevent damage to the instrument; should there be a short circuit between the grid and filament, no change whatever will be noticed on switching the lever from negative to positive, since shorting of the grid renders it inactive as a controlling element.

Straight-Line Frequency Condenser Employs Coiled Plates

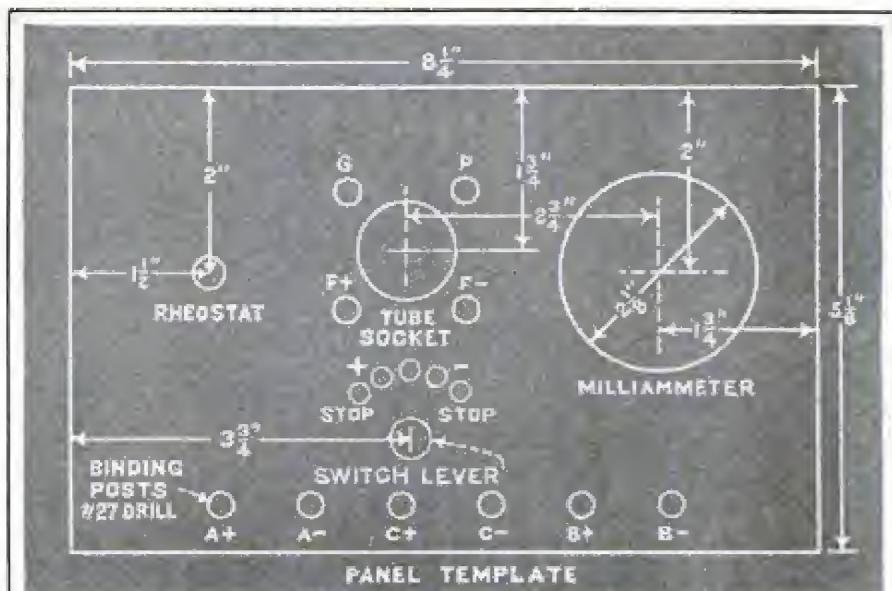
A new straight-line frequency condenser employing coiled plates



Dust-Proof Straight-Line Frequency Condenser Employs Two Shielded Plates in the Form of Coils

is interesting as a variation from the plate type in common use. It consists of two plates in the form of a clock spring; and is inclosed in a transparent, dust and

If the tube plate emission has fallen off, values of plate current will be materially less than those shown in the table, and



there will be a much smaller increase in the reading when the switch lever is thrown to the positive contact. Some tubes of low plate emission can be rejuvenated to almost their former value with any of the simple tube boosters now on the market, and when placed back in the tester will show much greater efficiency.

A large blueprint, including circuit diagram, battery connections and chart, may be obtained from the Radio department, Popular Mechanics Magazine, 200 E. Ontario st., Chicago. Include 15 cents to cover postage and packing. Specify blueprint No. 111.

moisture-proof case. The terminals are taken out through the back of the case, making a very compact and neat unit; a 4-in. dial is supplied with each condenser.

Honeycomb Coils Ideal for High Waves

For high wavelengths, honeycomb coils make an ideal form of inductance. Bank-wound and honeycomb coils, on these waves, have comparatively low resistance, and are compact and easier to handle than the old type of solenoid coils formerly used for this purpose. The large amount of wire necessary in a coil that will tune to the high waves presents a definite mechanical problem, if space is to be conserved. A compact honeycomb coil, 1 in. thick and 5 in. in diameter, can only be duplicated in inductance value by a solenoid coil 3 ft. long by 6 in. in diameter—out of all reason in the modern set.

Harnell Mfg. Co.



Kinks for Superheterodyne Builders

By F. L. BRITTIN

IN fulfillment of a promise made to our readers a short time ago, Popular Mechanics radio laboratory offers the following suggestions to 1926-model superheterodyne builders. A careful check has been kept on the inquiries received and the kinks or suggestions given in this article have been prepared in answer to them.

One of the most frequent requests is for a diagram showing how to use a.f. transformers in the 1926-model instead of the resistance-coupled unit, as many have these transformers on hand and do not wish to go to the expense of buying an additional unit.

The few changes necessary are shown in Fig. 1 on the blueprint page. A phone jack and filament switch are mounted on the front panel in the positions indicated. The switch is connected in the negative line; the a.f. transformers and extra sockets are mounted on the subpanel so as to permit as short leads as possible, the arrangement being shown in the rear-view photos. The exact position of these transformers will vary according to the types used. A ratio of 2 to 1 is suggested for the second stage; the first stage may be either 6 to 1 or 3½ to 1, as desired, but the transformers must be of the heavy type now on the market if good results are to be obtained.

The maximum B-voltage required in this case is ninety; this terminal post is placed at the extreme left of the subpanel, and is connected to the frame or bottom blade of both the phone and horn jacks. A lead is also taken from this line to the B-positive terminal of the A and B voltmeters, and from the underside of the terminal post to the B-post of the second a.f. transformer.

It is also necessary to mount a 4½-volt C-battery on the subpanel, which is held in place by means of two small brass brackets; a binding post for the positive and negative leads holds these brackets in position as shown. A lead is taken from the negative-C binding post on the

underside of the subpanel and run to both F-posts on the a.f. transformers; the positive lead from the C-battery is then connected to the negative-A line. All leads are shown exactly as they appear in the laboratory model, and are very simple to follow; the light leads indicate those that are run below the subpanel.

To operate the set place two 201A tubes in the amplifier tube sockets, and turn on the switch. If the phones or horn are used in the phone jack, seven tubes are in use; the eighth tube is not lighted. Plugging the horn in the filament-control horn jack lights this tube. To control the volume on the horn jack, it may be necessary to turn back the detector rheostat on the first detector tube, or a volume-control horn plug can be used; this is a new device and is known as a "modulator horn plug." A small dial mounted on one side of the plug is adjustable so that the volume can be regulated from a whisper to maximum without touching any other control on the set.

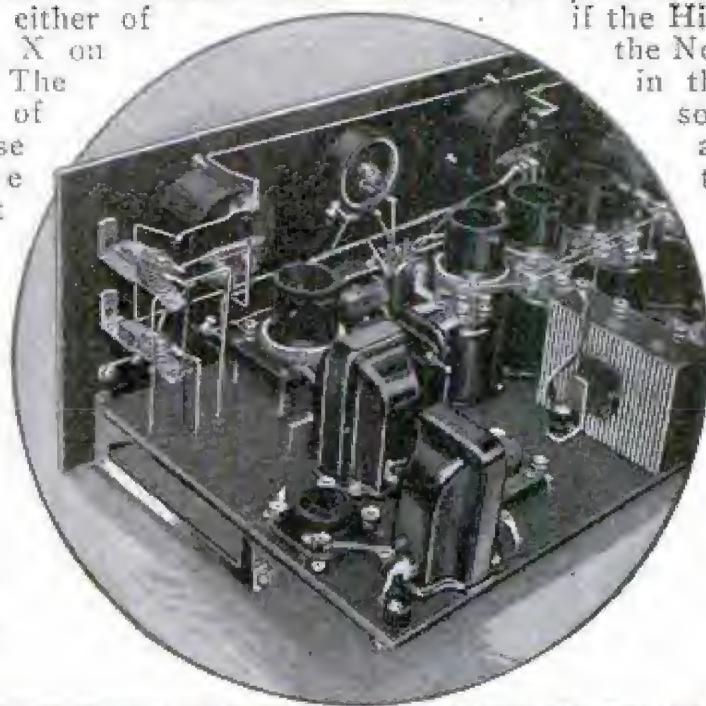
The second largest number of inquiries received from builders of this 1926-model superheterodyne asked for some means of cutting out the resistance-coupled amplifier temporarily, so that phones could be used on local stations. Volume can be regulated by the modulator horn plug referred to above without any change whatever in the present circuit, but for those who wish to cut out the resistance-amplifier unit entirely, for using the phones, the simplest method is to mount an open-circuit jack below the horn jack, and run a lead from the frame or lower blade of the jack to the input B-post on the amplifier unit, and from the upper blade of the jack to the input P-post. Extra lugs can be mounted on these posts for this purpose and no connections in the set disturbed. A blank horn plug is then plugged into the horn jack to turn on the filaments of the tubes, and the audio rheostat is turned completely off; this cuts the amplifier unit with its three tubes out of the

circuit, and the phones can then be plugged into the phone jack.

Cutting one or two stages out of the amplifier unit is a little more complicated, but Fig. 2, in the blueprint diagram, shows a simple method especially designed for as few changes as possible. An open-circuit jack is mounted on the front panel just below the horn jack. The output B-lead is run to the frame or bottom blade of each jack, the upper blade of the phone jack being connected to a flexible lead which is taken to either of the points marked X on the amplifier unit. The schematic diagram of the unit shows these points to be plate leads of the first and second amplifier tubes. A soldering lug can be placed under the resistor-clip screw at either point and the flexible lead soldered in place. The tubes not in use can then be removed from the amplifier unit if desired. To use the phones or

will find the modulator horn plug will reduce the volume so that phones can be used on the 9-tube load if desired.

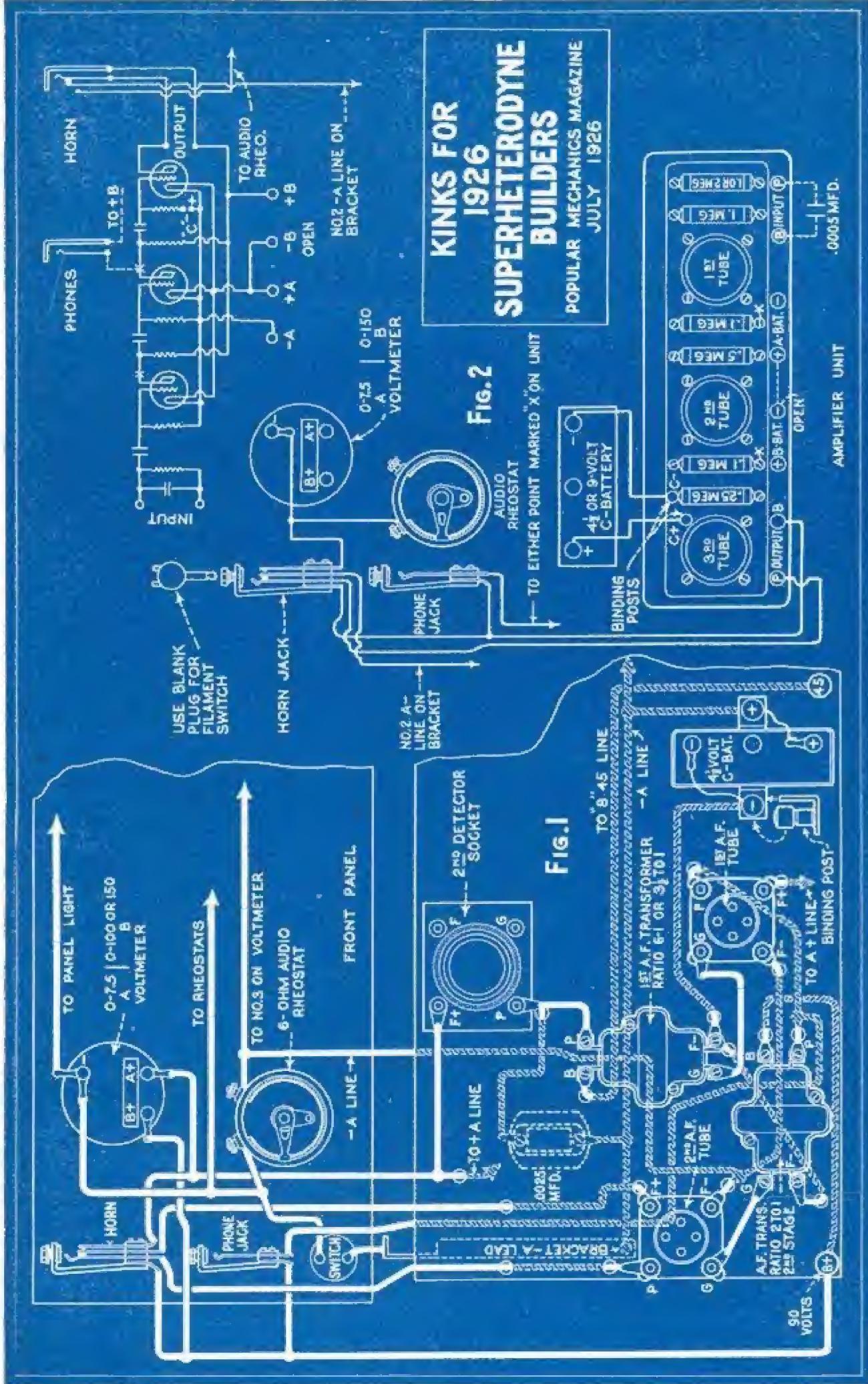
A C-battery is a necessary addition to all sets using any type of a.f. amplification, to conserve the B-battery. The newer resistance-coupled amplifiers are provided with C-battery binding posts, as shown on the amplifier unit in Fig. 2. The C-battery is shown above the unit properly connected. If 201A or similar tubes are used, a $4\frac{1}{2}$ -volt C-battery is required; if the Hi-Mu tubes are used, the No. 20 types are placed in the first and second sockets of the unit and a Hi-Mu No. 6 tube is placed in the last socket, but do not use these tubes in combination with 201A tubes. With these tubes and the specified 135-volt B-battery, a 9-volt C-battery should be used. For this purpose connect two of the $4\frac{1}{2}$ -volt C-batteries in series. If the 201A tubes are



Rear View of 1926-Model Superheterodyne Employing A.F. Transformers Instead of Resistance-Coupled Amplifier; Above, Enlarged View of Amplifier Section, Showing Distribution of the Units

loud speaker in the phone jack, place a blank phone plug in the horn jack to turn on the tubes, and plug the phones or horn in the phone jack below. Do not use Hi-Mu tubes in the amplifier unit when using the phone jack. Those who merely wish a volume control and do not care to go to the trouble of putting in the extra jack

used in the first two stages, and a 112-type power tube in the last stage, the same C-battery of 9 volts is used. For those that have the older type of resistance-coupled amplifier units, the C-battery posts are easily added. Referring to the schematic diagram, note the position of the negative C-battery connection, at the



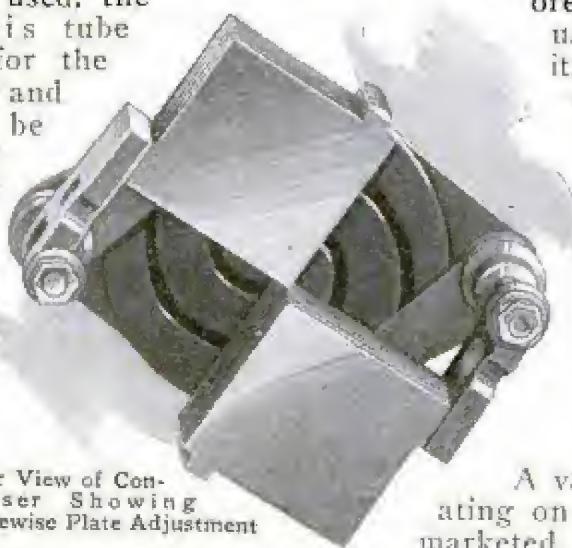
end of the last grid resistor; an inspection of the underside of the unit will show the resistor terminal connected with the A-negative post on the last tube socket, by means of a short metal strip. This metal strip is removed and two small binding posts are mounted in the place of the machine screws. The negative side of the C-battery is then taken to the post on the resistor clip and the positive side goes to the negative-A post on the last tube socket. The location of the C-battery posts on the upper side of the unit is clearly defined in the picture diagram of the unit.

A .0005-mfd. fixed condenser will be noted across the B and P input posts on the unit; also a 2-meg. resistor is substituted for the .1 resistor in the first input clip of the unit. With the by-pass condenser in position the r.f. current is kept out of the audio-amplifier unit and the resistor of higher value enables the operator to balance the set with ease.

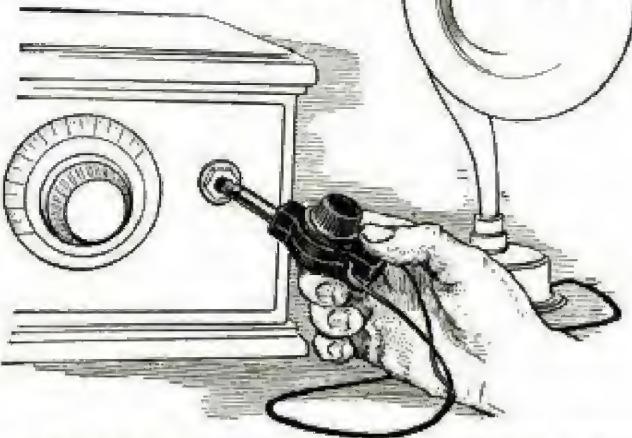
Leaving the audio-amplifier section of the set, we will now consider the second detector. This tube can be either a 201A-type or a No. 20 Hi-Mu tube; a $\frac{1}{4}$ -amp. "amperite," or "ballast," is used for this tube instead of a rheostat. If this resistor unit is defective, the set will have poor volume and give unsatisfactory results. The intermediate-frequency tubes should be uniformly matched, and the grid and plate leads from the transformers to the tubes as short as possible. The first detector tube can be either a 200 or 201A-type, but preferably the latter. If this type of tube is used, a 25-ohm first detector rheostat should be used, the rheostat controlling this tube only. The B-voltage for the plates of the first detector and oscillator tubes should be kept at the original 18 volts specified; use the poorest tube you have for the oscillator. The low oscillator plate voltage prevents blocking of the first detector tube and is one of the reasons for the highly satisfactory results obtained with this receiver.

A large blueprint diagram covering the alterations suggested in this article may be obtained from the Radio department, Popular Mechanics Magazine, 200 E. Ontario st., Chicago. Send 15 cents to cover postage and packing. Specify blueprint No. 112.

Rear View of Condenser Showing Edgewise Plate Adjustment



Volume and tone control without changing your set in any way can be obtained with a new modulator plug. The device takes the place of the usual horn or phone plug and is slightly larger, with a small bakelite knob on one side. Turning the knob varies a graphite



Volume-Control Plug Connected to Horn Cord Ready for Plugging into Set

resistance in the plug base. With this adjustment, the operator can regulate the volume from a whisper upward, without touching any other control.

Paint on Radio Sets

On many homemade radio sets the baseboard is given an application of paint to better its appearance. But ordinary colored paint should never be used for this purpose, as it contains ingredients which allow a slight electrical leakage across the instruments, which are mounted on the baseboard. Only a good grade of oil stain should be used.

Condenser Operates on Spiral Cam

A variable condenser operating on a spiral cam, recently marketed, is claimed to separate uniformly over the entire 360 degrees on the dial, all broadcast wavelengths from 150 to 600 meters. The cam governs the relation of the movement of the plates to that of the dial. The insulated parts are out of the condenser field and resistance losses are claimed to be extremely small.

Signal Electric Mfg Co
Menominee

Receiver Has Tuning Lever

Instead of Dials

Letter read 6
A new receiver employing a tuning lever instead of the usual dials has appeared on the market. In general appearance the set



New Receiver, Showing Tuning Slot Which Takes Place of Usual Dials

is no different from the ordinary receiver except for the calibrated slot which takes the place of the dials. A tuning knob is moved along the slot to locate stations.

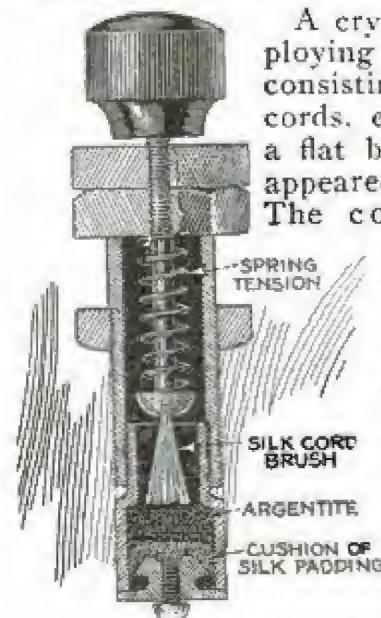
Preventing Surface Losses

It is of the utmost importance in radio broadcast reception that all parts of the receiver should work with greatest efficiency. The great difficulty in most sets is the inability to conserve the minute amount of energy collected by the aerial. When it is remembered that the very small amount of energy received by the antenna from the distant station, after going through the proper instruments, must emerge in such volume as to be heard in a large room, it will readily be seen that any losses between the aerial and the horn will affect good reception. Hence all parts, such as coils, transformers, condensers and wire joints, must have the least possible resistance, and insulation must be as perfect as we can make it in order to eliminate losses. It is characteristic of electricity that it will take shortcuts from wire to wire and to the ground. If any part of the receiver allows these high-frequency currents to wander from one part to another, sensitivity will be lessened, which in turn shortens reception

range, and adds other difficulties that cause the beginner much unnecessary worry. The panel, therefore, plays an important part in securing good results, and it should invariably be of the best insulating material possible, never of wood, as this will absorb moisture and is never entirely free from it. Many radio builders prefer a dull-finished panel to one having a glossy surface, as they think it looks better, but actual practice tends to show that the former is not as efficient as the glossy one. The practice of some radio builders to remove the glossy finish by roughening the surface with fine sandpaper, finishing with pumice stone and oil, is not to be recommended. The surface of a panel so treated resembles a series of minute hills and valleys. When the oil and pumice stone are applied, dust from the air is firmly fastened to the panel, and the oil collects more dust which quickly forms a high-resistance leakage path from terminal to terminal and from one instrument to another. Moisture, too, is more easily absorbed by the roughened surface and further aids the current to wander about. It is essential that both sides of the panel and subpanel be smooth. As an instance of wrong practice it may be worth while to mention the experience of a radio beginner who painted his radio panel to match the cabinet with the result that the range of his five-tube set was cut down to 65 miles with very poor reception at that, because the lead in the paint short-circuited the instruments.—W. S. Standiford, Youngstown, Ohio.

660

Detector Employs Tinsel Contact Brush



A crystal detector employing a contact brush consisting of forty silk cords, each wound with a flat bronze tinsel, has appeared on the market. The construction is clearly shown in the sectional view herewith. The adjustable spring insures the proper tension, the forty points of contact on the crystal improve reception, and the cushion of silk padding at the

base is said to pick up all "frequency energies" and prevent corrosion.

*Baker-Smith Co. Inc.
new Call Bldg. 201*

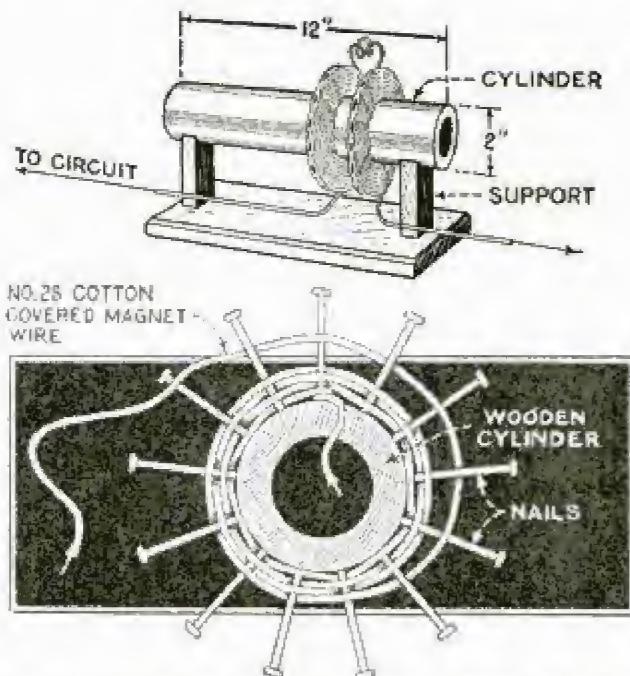
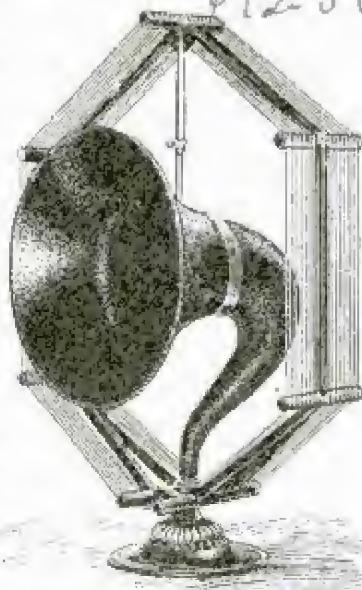
Keep the Leads Short

All leads between instruments in a radio set must be kept as short as possible. When fastening the soldering lugs on the various instruments before wiring the receiver, set the lugs so that they point as nearly as possible in the direction in which the connecting wires are to run. This will not only make for neatness and convenience in wiring, but will also improve the reception, sometimes to an unbelievable degree. Not seldom, sets are seen in which the builder seems to have gone to a great deal of trouble to make the leads as long as possible. In some, the soldering lugs were both pointed in the opposite direction to that in which the wire should have run to get the shortest possible lead, and the wire, instead of running in a straight line from lug to lug, had been so bent that it was actually four times as long as it should have been. In an extreme case, the grid leads, which, by slightly rearranging the transformers and sockets, could have been kept down to $\frac{3}{4}$ in., were, when measured, $4\frac{1}{4}$ in. long, a considerable difference, and one that was apparent in the operation of the set.

Loop Aerial Combined with Loud Speaker

A loop aerial that can be combined with any loud speaker of the type shown in the illustration, is now available. This combination makes a practical, attractive and efficient unit in a very limited space. The wires are held in their proper relation by insulated spacers. To install the loop, the base of the horn is removed, and the loop clamped to base with two springs; the horn is then slipped between the latter. A sliding pivot at the top of the loop is adjusted to carry its weight at the proper height and directly over the base of the horn; the point of the pivoting rod is then pressed into the horn and the unit is ready for use.

Compensating springs at the bottom make the loop fit the horn and permit it to revolve.



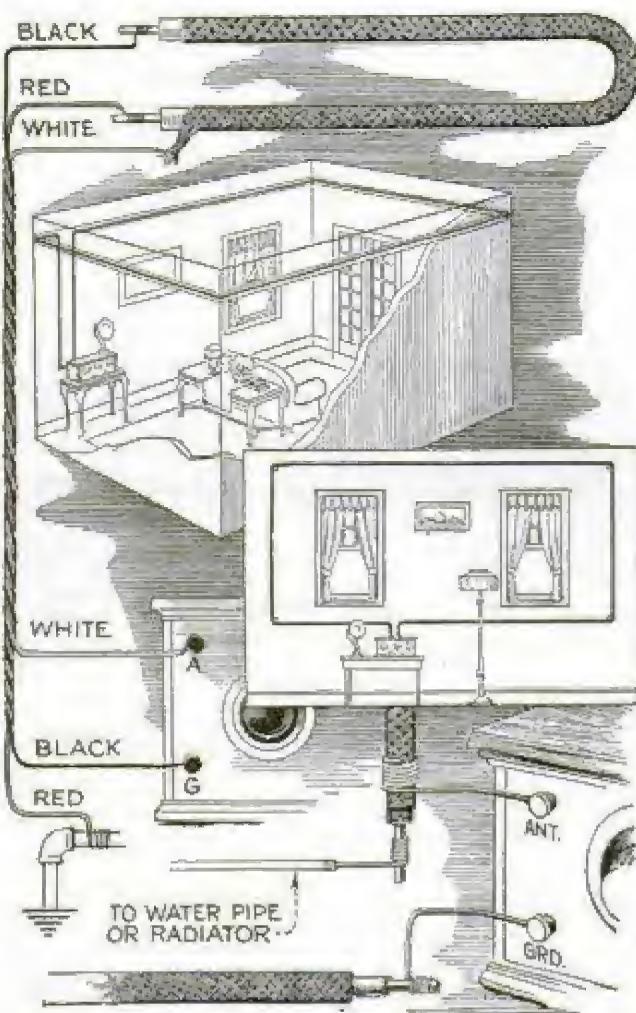
Above, Completed Coils on Cylinder; Below, Manner of Winding the Coils

Simple Variable Inductance for the Beginner

A simple variable inductance can be made at small cost from odds and ends around the average experimenter's work-bench. A wooden cylinder, 2 in. in diameter and 12 in. long, is used both for winding and mounting the coils. One-fourth pound of No. 26 c.c. magnet wire will be sufficient for the coils. Close to one end of the cylinder, drive 13 nails into the cylinder at equidistant points around its circumference as shown in the lower illustration. This makes the form for winding the coils; wind the wire in and out around the nails so as to have a coil about 4 in. in diameter when completed. Dip the coil in melted paraffin, and when cool, remove the nails and slip off the coil. Make another coil in the same manner, and mount the two coils on the cylinder so that they can be moved toward or away from each other. Then connect them as shown; if good results are not obtained at first, reverse the connections between the coils. Support the cylinder on two small wood blocks, using brass wood screws to hold them in position. The proper inductance is gauged by the distance separating the two coils.—Stanley Radcliffe, Laurel, Md.

Dry cells can be revived temporarily by punching holes in the base and soaking the battery in vinegar for 24 hours. This charge will not last long, but will answer in an emergency when new cells are not immediately available.

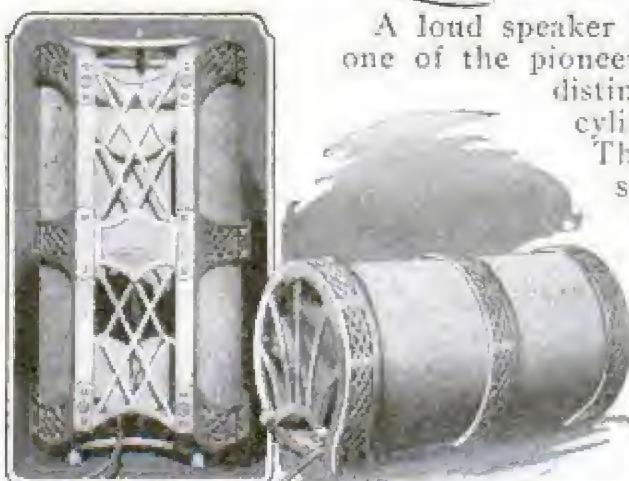
Richard J. Davis, dnc



Indoor Aerial, Which Combines Wave Collector with Condenser and Filter Effects

Indoor Aerial of Unusual Design

A new and unusual type of aerial for indoor use has a center core of solid copper, over which a rubber insulation of high quality is placed, while the covering consists of braided tinned-copper wire. When this antenna is used in the form of a loop, the inner core acts as a magnetic return ground, designed to increase selectivity and tone quality; when used as a straight aerial the outside tinned-copper braid, because of its large surface area, is an ideal wave collector, the inner core acting as a magnetic-field ground. This dual-conductor construction has the effect of a condenser the full length of the aerial, and is claimed to be an ideal filter for grounding out or neutralizing noises, leaving the aerial to bring in the radio.



Cylindrical Loud Speaker Can Be Used Either in an Upright or Horizontal Position

waves without distortion. If used in the attic or around the room, it is unnecessary to use insulators.

Read the Article Too

One of the commonest faults of the home radio builder, making a set from a description published in a magazine, is that he "reads" only the pictures, drawings and list of materials. More often than not, the article itself contains information that is vital to the successful building or operation of the set, information that cannot be incorporated in the drawings, and, if the prospective builder skips the reading matter, he will wonder why his set does not work as expected. Another very common fault is substitution, either of materials or in methods of placing instruments and of wiring the set. Radio writers do not specify certain instruments because they prefer one or two particular makes, but because they have found that these work best in the set described. In another type of set, entirely different instruments may work best. In many sets, any condenser, transformer, coupler, etc., will work well, but, where the writer specifies a certain instrument, the builder should use it and no other. If he does not, he may not have any trouble, but the chances are that he will, and then he will blame the writer instead of himself. Don't be in too much of a hurry when building the set. It has been the experience of many radio editors, when a set will not work properly, and the reader swears that he has checked every wire, and that the set is "exactly according to specifications," that even a cursory examination will show one or two points where instructions have not been followed.

Horn Has Cylindrical Diaphragm

A loud speaker recently developed by one of the pioneer radio laboratories is distinguished by an almost cylindrical diaphragm.

The cylindrical vibrating surface is said to cause the sound waves to be distributed in a more natural manner than when projected in one direction, and give equal reproduction of all frequencies. The instrument can be used in either a horizontal or upright position.

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Iron in the Set

Don't use iron of any kind in the radio set. It may be in a place where it will do little or no harm, but ten to one, it will be the cause of several mysterious noises. One builder ran out of brass strip when building a superheterodyne, and decided that several small iron angles that he had on hand "would do well enough" for the contacts of the small $1\frac{1}{2}$ -volt flashlight cells used in the set. After the set was finished, he was troubled with a persistent hum, and, after checking and rechecking the circuit many times without discovering wherein he had made any error, he called in an expert. The latter was also puzzled for some time, but finally noticed, almost accidentally, that whenever a wire that ran directly beneath the iron angles was moved to one side and held there, the hum disappeared. Substituting brass for the iron cured the trouble immediately.

Compact Impedance Amplifier Unit

Compact audio-frequency amplifying units of the impedance-coupled type, recently put on the market, combine the choke coil with the gridleak and grid condenser, greatly simplifying the wiring. It is installed in the set in the same manner as ordinary a.f. transformers and takes up very little space on the sub panel. Three stages are used instead of the usual two a.f. transformers for practically the same volume. The tone, however, is claimed to be superior.

New Detector Tube Uses Small Plate Current

A detector tube, recently developed by Mr. Harold P. Donle, is said to be sensitive to a degree hitherto unapproached by any other tube. The electrical characteristics are somewhat similar to those of the Sodion tube, and it can be operated without either potentiometer, gridleak or grid condenser. The plate impedance is very high. With 22 volts, the plate current is only .1 milliamp., the filament current being .25 amp. at 5 volts.



770-30
768-A
Tube Being Tested under Operating Conditions, Rheostat on Set Controlling Filament Supply

Instrument for Checking Radio Tubes under Operating Conditions

Checking tubes at home is a simple matter with the little instrument shown in the illustration. Each tube can be checked under identical conditions of actual operation. The tube is placed in the instrument, and the plug is put in the socket of the set. After making all connections, the condition of the tube is indicated by the milliammeter.

Soldering in Corners Aided by Wire Extension

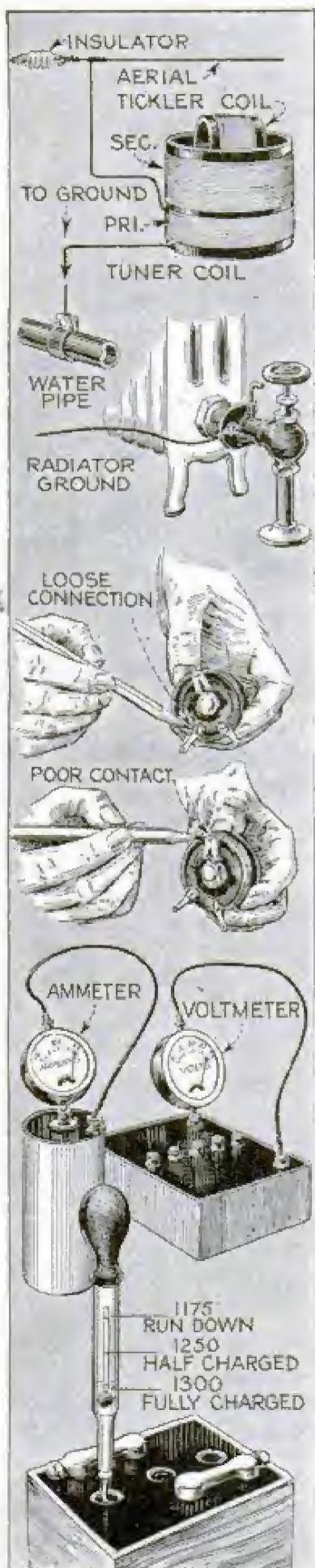
A short length of busbar wire wound around the copper bit aids in soldering joints in awkward places. The radio builder, working with a man-size soldering iron, is frequently hard put to find a way of getting the point into some out-of-the-way corner of the set. The method of fastening the wire to the bit is clearly shown in the illustration; the projecting end should be long enough to reach the desired point, and sufficient heat will be transmitted through the wire to melt the solder and obtain a good joint.—A. C. Cole, Chicago.



770-30
768-A
Jewell Electrical Equipment Co.
1650 Walnut Street, Chicago, Ill.

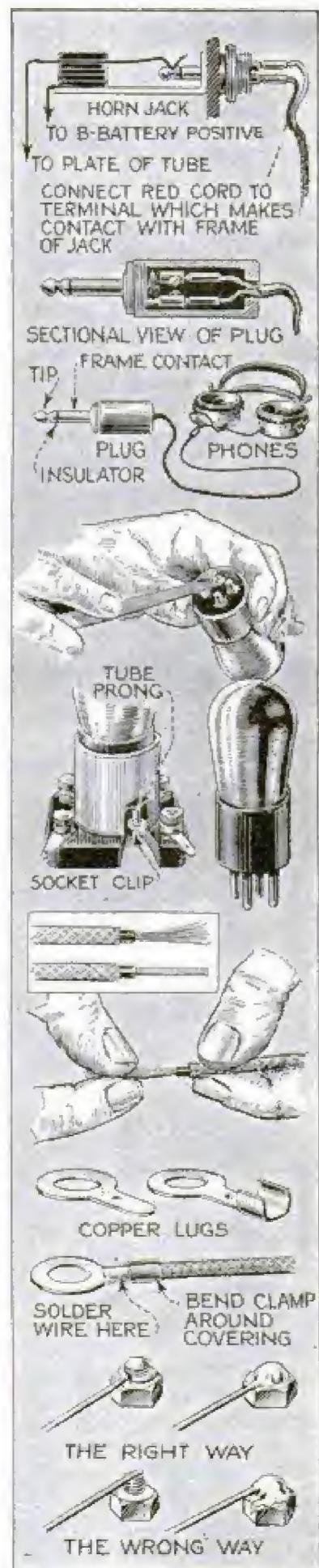
What's Wrong with Your Set?

By FLOYD GRAHAM



THE detector is the heart or mainspring of the radio receiver. It may be a crystal or a vacuum tube, but upon its efficiency depends the performance of the set. The purpose of the detector is to change the radio waves at the receiving set from high-frequency (above audibility) to audio-frequency so they can be heard. The necessary circuit for bringing about this change and delivering the audio frequencies to the headphones or loud speaker, where the electrical impulses are converted into mechanical sound waves, is called the detector circuit.

Many things can go wrong or be wrong from the first with the various units that make up this important part of any radio receiver. The tuning unit shown is a common one, used in receivers of the three-circuit type, and will do for illustrating the faults that may exist. We will first consider the winding; the turns may be shorted, due to solder dropings, or frayed insulation, and in this case the coil must be rewound. Enameled or d.s.c. wire is the best for this purpose. Weak signals are often caused by the connections to the tickler coil being reversed, for which the remedy is obvious. The aerial must be well insulated, to conserve the minute energy picked up from the transmitting station, so that losses will not occur between the aerial and the set. Cracked, or otherwise defective, insulators permit this feeble energy to leak to the ground through the accumulated dirt and moisture in these cracks. All aerial connections should be well soldered to insure a good electrical path; this also applies to the ground connections. If a water pipe is used, all paint and rust must be filed away before connecting the ground clamp. The ground clamps shown are of the approved type and insure



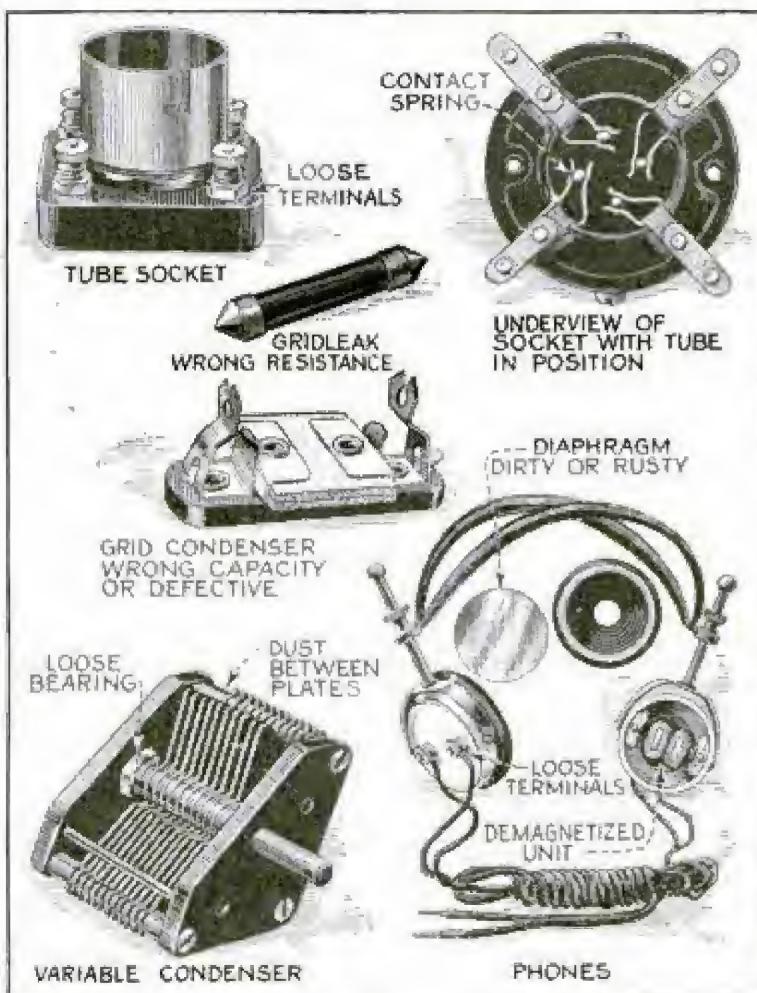
a good tight connection that does not require soldering.

Rheostats are units that are apt to go wrong; the terminal screws may work loose, or the sliding arm may make poor contact on the resistance wire. Tighten the screws and, if the sliding arm is loose, remove the rheostat and bend the arm so that it will make good contact when reassembled. Loose rheostat connections often cause the tube to flicker, resulting in weak and irregular signals. A vacuum-tube set requires an A and B-battery, which must be effective, or good reception cannot be expected. If the filament battery is of the dry-cell type, the cells can be checked with an inexpensive ammeter; when the cells fall below 10 amp., they should be discarded. If a storage battery is used, it should be tested with a hydrometer, care being taken not to spill the electrolyte, as it is corrosive. The method of reading the hydrometer is clearly shown in the illustration. The dry-cell or storage battery referred to is known as the A-battery and is used to light the filament of the tube. The B-battery usually consists of a number of dry cells connected in series, in one or more units, and the voltage is relatively high. Good volume and clear signals depend on the efficiency of this battery. The standard B-battery voltage for the detector tube ranges from 18 to 45 volts, depending on the tube used. These batteries are tested with a voltmeter in the manner shown, and, if found to have only two-thirds of the rated voltage, should be discarded.

Proper polarity of the phones and horn makes a great difference in the volume and quality of the signal. The phone cords

are usually marked for polarity; the positive cord tip being indicated with a red tracer cord and standard phone plugs are now marked for this positive connection. If not, trace the connections to the jack as shown. The positive B-battery connection should be on the frame of the jack. The frame makes the connection to the shaft of the plug, and the tip of the plug, separated by an insulator, as shown, makes the contact to the blade of the jack connected to the plate of the tube. The vacuum tube must make a good contact in its socket; the prongs also must press firmly against the spring clips, and these points of contact must be kept clean. The tube prongs are tipped with solder, and a slight corrosion at these points will often give poor contact; a nail file can be used to brighten these contacts, but take care not to file any more than sufficient to brighten the points.

Careless wiring will produce poor results sooner or later. If stranded insulated wire is used for the circuit, carefully remove the insulation at the point of contact, and twist the strands firmly together before soldering. Soldering lugs should be used under all terminals and the wire soldered to the lug. These lugs are made of tinned copper and come in a variety of shapes. If round tinned-copper busbar wire is used, and this is advised, a loop can be formed at the end of the wire, making a good mechanical contact before the solder is applied. Both the right and wrong way of making these connections are shown. Merely laying the wire on the terminal to be connected and applying the solder makes a very poor contact both mechanically and electrically. Poor in-



later. If stranded insulated wire is used for the circuit, carefully remove the insulation at the point of contact, and twist the strands firmly together before soldering. Soldering lugs should be used under all terminals and the wire soldered to the lug. These lugs are made of tinned copper and come in a variety of shapes. If round tinned-copper busbar wire is used, and this is advised, a loop can be formed at the end of the wire, making a good mechanical contact before the solder is applied. Both the right and wrong way of making these connections are shown. Merely laying the wire on the terminal to be connected and applying the solder makes a very poor contact both mechanically and electrically. Poor in-

2975 *Cottage Grove*
at Chicago

sulating material in the socket will cause a surprising loss of efficiency. Examine the socket and, if it is of the cheap "mud" construction, discard it. The spring clips in many of the new sockets are of the type shown in the underview illustration. It will be noted that the clips make a firm contact with the sides of the tube prongs, offering a much greater contact surface. Some sockets are constructed so as to make both end and side contacts. See that the terminals on the socket are tight; it may be necessary to remove the knurled nut, and tighten the lower hexagon nut with a pair of pliers. Some of the newer sockets are provided with soldering clips instead of the knurled-nut terminals, in order to minimize loose connections.

The gridleak is a small but important part of the set, and must have the proper resistance for the detector tube used. It is a good idea to have several gridleaks of various values and try them in the set until the one that gives the best results is found. The grid condenser may be defective due to faulty design or careless soldering. Never apply a soldering iron directly to a condenser of this type, as the heat will destroy it. Soldering lugs should be fastened to the condenser by means of short brass machine screws and the leads soldered to these lugs.

Phones often become demagnetized by continually using them on reversed polarity, and are frequently damaged by dropping, as good phones are as delicate as a watch. In cases of this kind, it is best to return them to the manufacturer for repair. Keep the diaphragms free from rust and dirt; these thin disks must be in good condition or the quality and strength of the signals will suffer. The phone-cord terminals fastened to each unit must be kept tight, and the cord itself should not be allowed to become badly twisted. The delicate tinsel conductor is easily broken, resulting in crackling and popping noises in the phones. Renew the cords when they show signs of hard use. All these remarks, of course, apply also to the loud speaker.

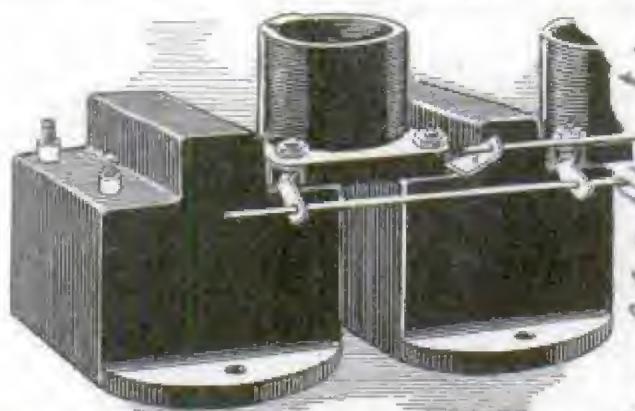
Variable condensers are not the source of as many troubles now as they were in the past due to better design and construc-

tion, but loose bearings and dust accumulation between the plates will result in poor operation even with the best types. Keep them clean, and keep the bearings tight for best results.

775 A.F. Transformers Eliminate Unnecessary Wiring

A.f. transformers and sockets, so designed that connecting leads are unnecessary, are now available. It is a well-known fact that short leads produce best results, eliminating feedback and preventing loss and distortion. Sharp tuning and tone quality depend on these factors. Units of this type simplify construction and add much to the appearance and efficiency of the

set. The compact assembly permits the builder to put his set in phonograph cabinets and other pieces of furniture with plenty of room to spare.

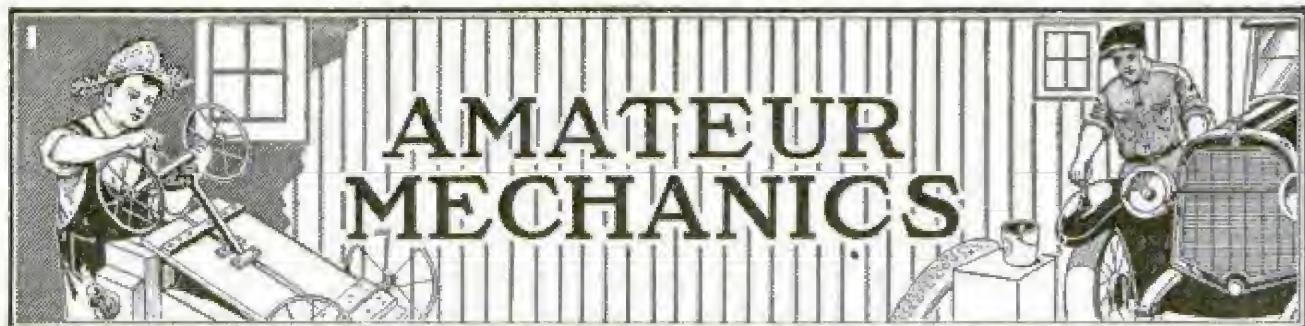


A.F. Transformers with Sockets Mounted Directly on Them Make Connecting Leads Unnecessary

Microphonic Noises

One of the most common troubles in manufactured radio sets having ordinary sockets riveted to the subpanel, as well as many homemade sets, without shock-absorber sockets, is a loud, clear, ringing noise in the loud speaker, which starts softly and gradually increases in intensity until it is exceedingly annoying. This noise is caused by vibrations transmitted to the detector tube, and the best way to eliminate this trouble is to install a cushion-type socket for the detector tube. You will also find that one tube may be much more microphonic than another, so change tubes until you get a good one and then mark it. Microphonic noises are seldom caused by vibrating r.f. or a.f. tubes. Another temporary method of eliminating microphonic noise is to mount both the radio set and the loud speaker on sheets of sponge rubber.

See to it that the flare of the horn does not face the radio set directly as even the air vibrations caused by the loud speaker will affect the delicate detector tube. The loud speaker should not be set directly on the cabinet for the vibrations are easily transmitted in this way.—E. R. Haan, Chicago, Ill.



“Merry-Go-Twist” Gives Plenty of Thrills

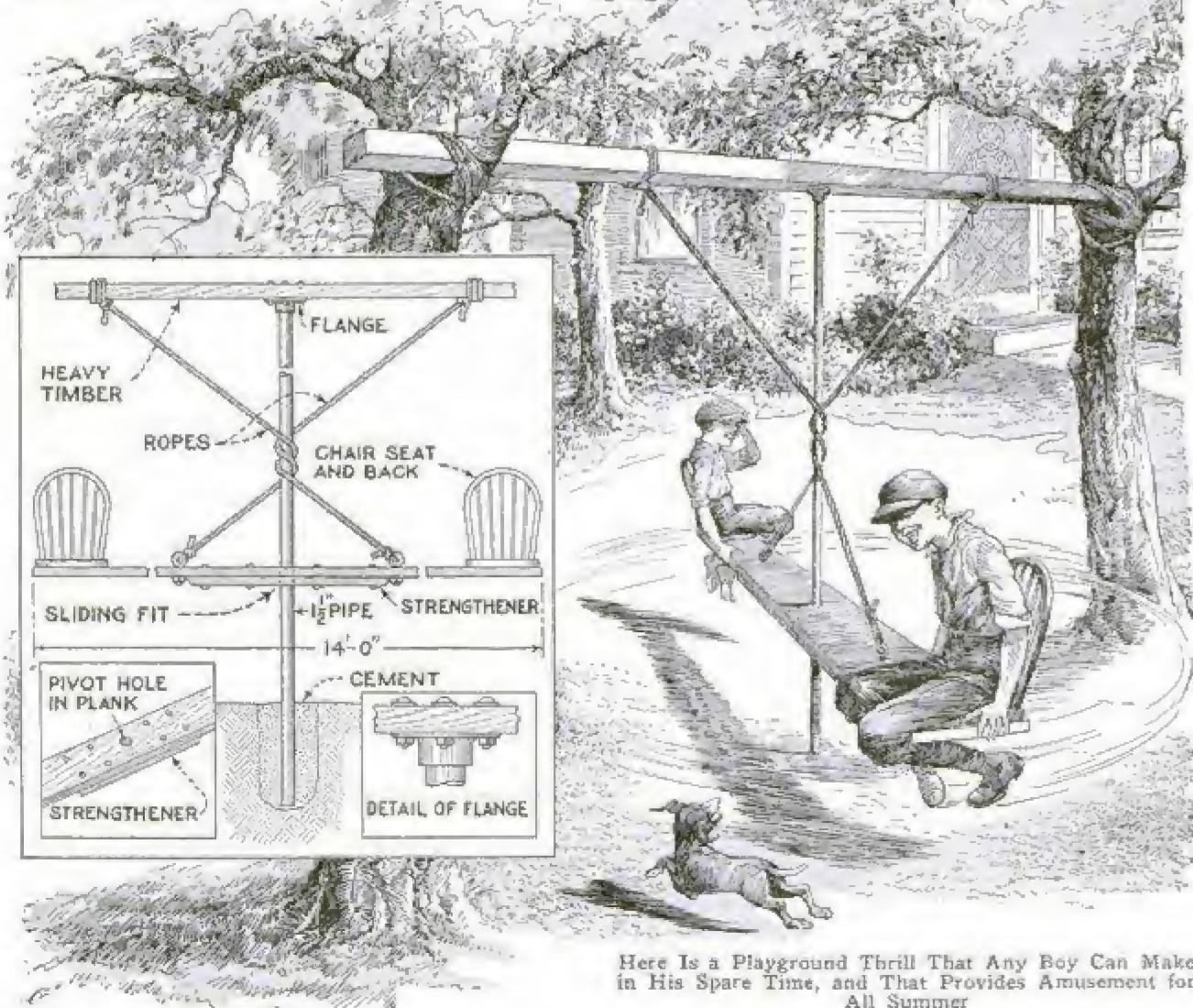
By L. B. ROBBINS

TWIST it up; let it go, and there you are! How's that for fun? Three twists for a nickel. All aboard again, and let her go!

A “merry-go-twist” can be built by almost any practical-minded boy and will cost little more than a few hours' labor. All it requires is a long, wide plank, some piping and fittings and a heavy timber and rope, for the essential parts.

First clear away a space about 20 ft. in diameter with level ground between two trees. With the help

of someone, raise the heavy timber, which may be a piece of four-by-four or similar stock, and lash it to the trees about 10 ft. from the ground. If two limbs about the same height can be found on the trees, the



Here Is a Playground Thrill That Any Boy Can Make in His Spare Time, and That Provides Amusement for All Summer

timber can be lashed over them, but if not, lash it firmly to the trunks and spike a block of wood below the ends so it will not slide down out of level. Then get an old piece of $1\frac{1}{2}$ -in. pipe, about 12 ft. long, and a floor flange that will thread on one end. Dig a 2-ft. hole under the middle of the timber for the foot of the pipe.

The plank should be cut about 14 ft. long and may be 2 by 8 or 2 by 10 in.; either size will do. Bolt a short piece under the center to strengthen it, and then bore a hole large enough to slip easily over the pipe in the exact center of the plank.

Remove the legs from two old kitchen chairs and nail one seat to each end of the plank. Set the hole in the plank over the hole in the ground, place the foot of the pipe through the plank and let it rest in the hole below. Then push the flange under the overhead timber and fasten it in place with lag screws or bolts. Block up the plank about 2 ft. off the ground

and fasten a strong rope to a screw eye bolted through the plank at each end of the strengthener. Twist each rope about the pipe once and tie the other end to the overhead timber at about the same angle as to the plank. It will be noticed that the chairs face in opposite directions on the plank. Twist the ropes so that, in untwisting, the chairs will be propelled front first. Then set the foot of the pipe by pouring cement in the hole and allow it to harden two or three days.

To operate the merry-go-twist, push the plank around a number of times until the ropes twist up tight on the pipe and will go no farther. Then let two passengers of equal weight climb into the seats and let go. As the ropes untwist from the pipe the speed will become greater and will not cease until the momentum of the plank winds them up several turns the opposite way. "Let the old cat die" before dismounting, and you will get all the fun there is out of it.

Convenient Towel Rack for Use on Hot-Water Heater



A handy and convenient rack for drying towels is shown in the illustration. A length of heavy wire is bent in the manner indicated to provide a series of hooks. The ends are clamped around the upright pipes on the boiler so that the hooks are suspended at a convenient height. When not in use this device is readily moved out of sight behind the boiler.

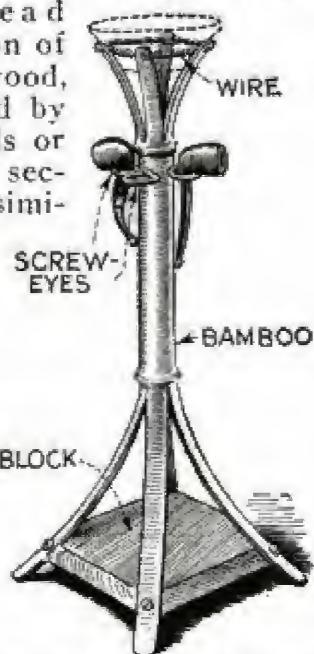
Doing Away with Cylinder Knock

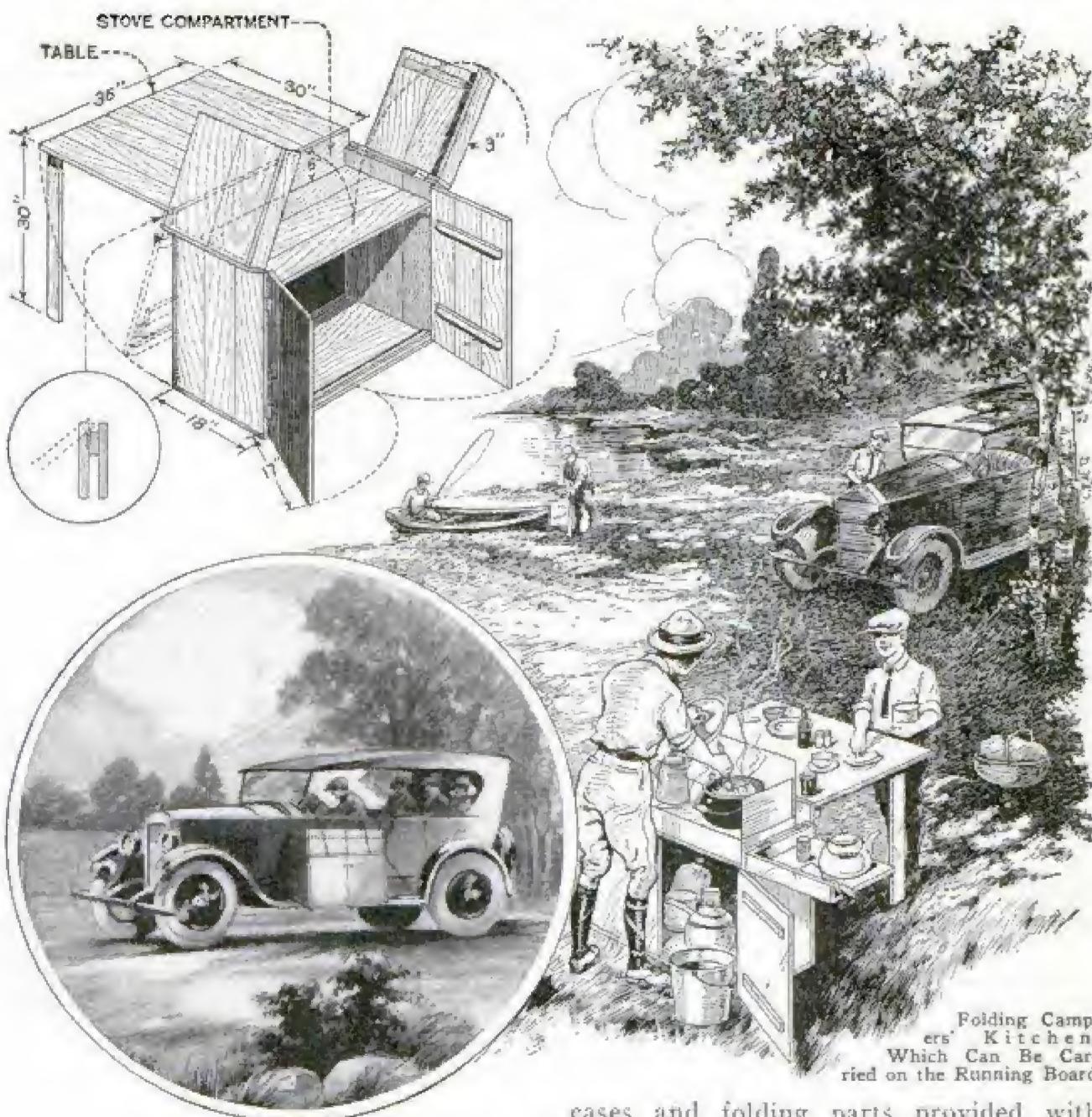
There was a hammering noise in a Ford, sounding like a carbon knock, noticed when climbing hills and when pulling through sand or mud. The owner had the carbon cleaned out, and the knock disappeared for a time, but it soon started again as bad as before. He then took the cylinder head off, removed the carbon,

replaced the top with an extra cylinder-head gasket, and was never troubled with the noise since. The car also runs and pulls much better.—Glen F. Stillwell, Collinsville, Ill.

Smokers' Stand Made of Bamboo

For use on the screened porch a simple and neat smokers' stand can be made from a short length of bamboo fish rod, as shown in the accompanying illustration. The butt end of the pole is sawed lengthwise into quarters to the first joint, and the pieces are spread apart for the insertion of a heavy block of wood, which is fastened by means of small brads or screws. The upper section of the pole is similarly quartered down to the second joint, and the ends are spread and wired securely to a heavy wire hoop of a diameter suitable to support a small dish or ashtray. To add to the convenience of the stand, several screweyes may be driven into the post for holding pipes.—G. E. Hendrickson, Argyle, Wisconsin.





Folding Camp Kitchen

In this compact camp kitchen everything is in reach of the chef. When folded it is 19 in. deep, 30 in. high and 36 in. long, permitting it to be carried on the running board or in the rear compartment of an automobile. As shown in the drawing, the legs fold up under the table, which drops flat against the back of the cupboard. The covers of the stove compartment swing out to the side and form handy shelves. The cupboard may be partitioned and provided with shelves to suit the individual taste. A few hooks for dishcloths, pans, etc., will increase its convenience. The outfit is so simple that anyone can construct it easily with ordinary tools. All dimensions are based on the use of $\frac{1}{2}$ -in. lumber throughout. Hinges that fold flat should be used in all

cases and folding parts provided with hooks to hold them in place when closed. A grab handle should be placed on each end of the cupboard to facilitate handling. The stove shelf, and all others, are set back $\frac{1}{2}$ in. from the front to allow the cupboard doors to close. The table legs are spaced so that they will lie edge to edge when folded inward, and the table is hinged to the back of the cupboard as shown in the enlarged detail.—Ronald B. Clifton, Denver, Colo.

Preserving Seed from Weevils

If seed beans or peas are kept in an old inner tube, they are safe from weevils. Be sure that the tube is dry, then pour the beans into the hole where the blow-out was, and put on a cold patch to make it air-tight. The tube may be hung, on a nail or a hook, in the barn.—Fred Cornelius, El Paso, Tex.



Wooden Rack on Ladder Rung Holds Shingles

Shingle Rack for a Ladder

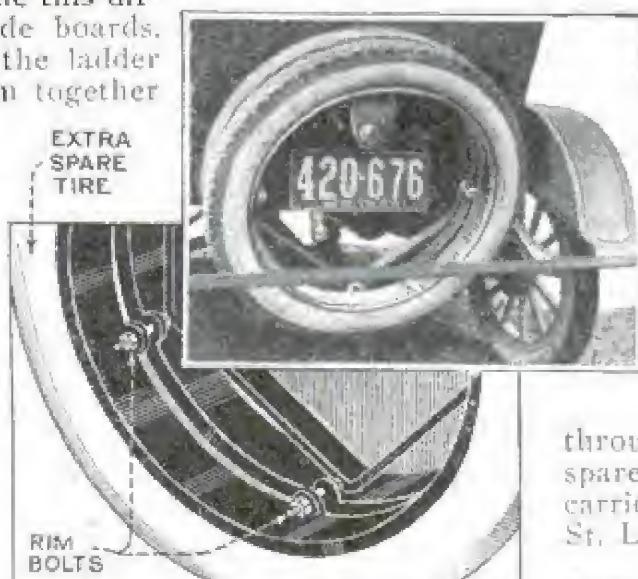
When nailing a few shingles to the side of the house or edge of the roof where it is necessary to stand on a ladder to do the work, it is nearly impossible to hold the shingles and do the work at the same time. A rack holding two or three dozen shingles and attachable to the ladder on any rung will overcome this difficulty. Get two wide boards, slightly longer than the ladder is wide, and nail them together at right angles to form a trough. Then cut two cleats of hard pine or other hardwood, 2 or 3 in. longer than the width of the upright board. The cleats are shaped like hooks at the top so that they can be slipped over a rung, as shown in the detail. When a shingling job is to be done, fill the trough with

shingles, carry it up the ladder and hang it on the rung just over your head. The shingles will then be accessible and will not interfere with the work.—L. B. Robbins, Harwich, Mass.

Making Soldering Easier

The inexperienced man who attempts to do a little soldering generally overlooks the fact that the piece of work must be hot before a neat application of solder can be made. That is why it is difficult to solder heavy metal. If you use an electric soldering iron, heat it while it is lying on the article to be soldered if possible. If the solder does not stick to the work rub the iron back and forth across the spot to be soldered and then try again. It is impossible to weld two iron rods together by just heating one of them, and it is just as impossible to solder properly without heating the work. Avoid, if possible, clamping the work in a large vise, as this tends to chill the work, due to the absorption of heat by the vise. Cleaning the part is another necessary soldering operation and one that is just as important as the first-mentioned, for securing a good job. However, if the parts are small and you wish to tin them, get them hot and dip them in acid, then do the tinning. To tin a large area, heat it with a torch and then apply acid with a squirt can. This will clean it quickly and easily and make the tinning process simpler. Acid will eat a hole in a metal squirt can in time, but a battery hydrometer with the float removed will make a good substitute.—Glen F. Stillwell, Collinsville, Ill.

Simple and Effective Tire Carrier



Rim Bolts Hold Extra Rims on the Carrier Securely

Three standard rim bolts solve the problem of holding the extra spare tire that many Ford motorists like to carry with them on a long trip. The recent-model rims have fixed lugs. The accompanying photograph shows how the rim bolts through these lugs hold the spare rims together on the carrier.—Charles E. Miner, St. Louis, Mo.

Never run a hacksaw too close to the vise jaws.

Beautifying Your Home Garden

By A. C. COLE

THE home owner who is able to use a few carpenters' tools can, at slight expense, add considerably to the appearance and value of his house. Few city or suburban lots are so small that there is no room for a simple rose arbor or trellis, a screen to hide an ugly alley view or to improve the appearance of the unattractive though useful garage, or a small pergola, even if it has no Corinthian columns leading to a long vista of formal garden. The examples shown in the accompanying illustrations are mostly very simple, and as before stated, need but little skill beyond the ability to handle hammer and saw, and occasionally a turning or keyhole saw.

The first thing is the selection of the lumber. The best all-around material for garden furniture of this type is cypress, or, if this is unobtainable locally, good yellow pine. It is sometimes hard to get cypress in "dimension" sizes, such as 4 by 4-in., and then yellow pine, which is generally available, can be used. Fir is also a good weathering wood, and one that takes paint well, and, where round posts are

built from standard sizes. Also, remember that lumber sizes are always the size of the rough lumber, before planing, so that a two-by-four is really not more than 1 1/4 by 3 1/4 in. in size.

All posts that are to be sunk in the ground, like the bearing posts of arbors, fences and pergolas, should either have their butts painted with liquid tar before being placed in position, or at least thoroughly painted with two or three coats of white-lead paint. A thorough soaking with creosote is also good to minimize rotting. Also, these posts should be sunk at least 3 ft. in the ground, or below the frost level, so that the heaving of the ground will not throw the whole structure out of plumb the first winter.

Another important thing is the fastenings of the structures. Use galvanized roofing nails or brass screws, which will not rust. Fastenings that rust not only

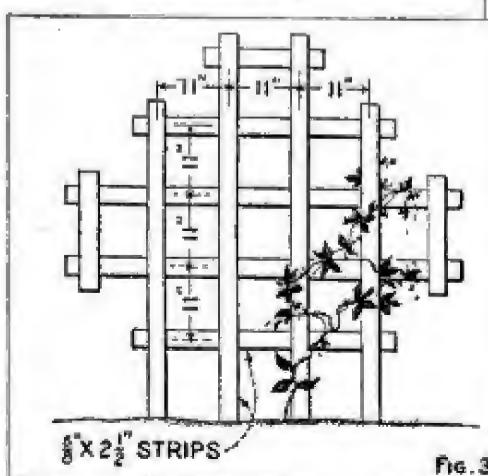


Fig. 3

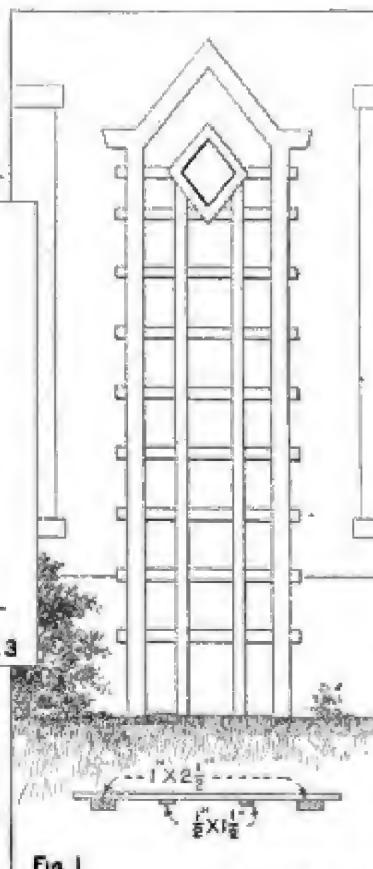


Fig. 1

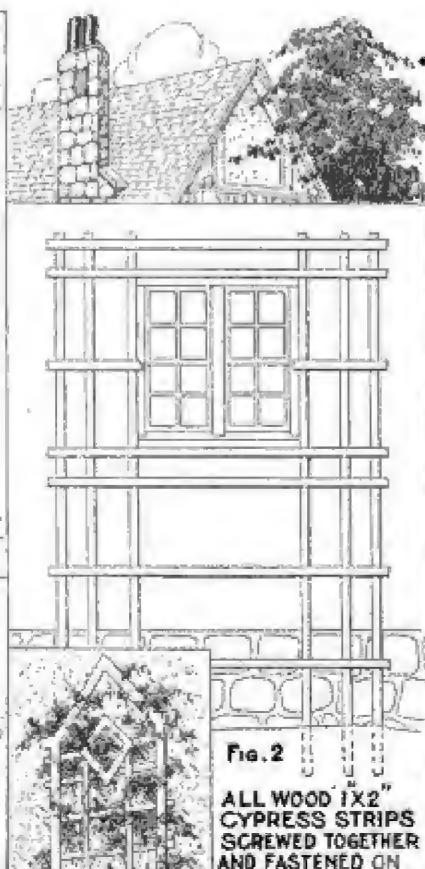
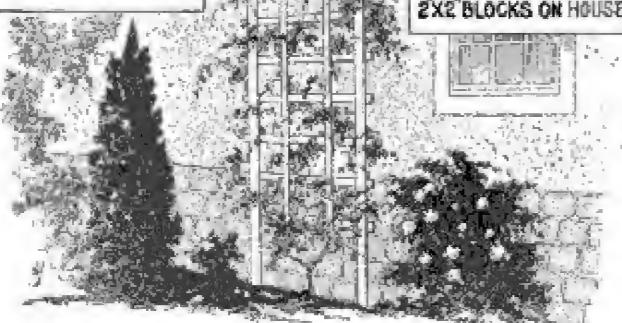
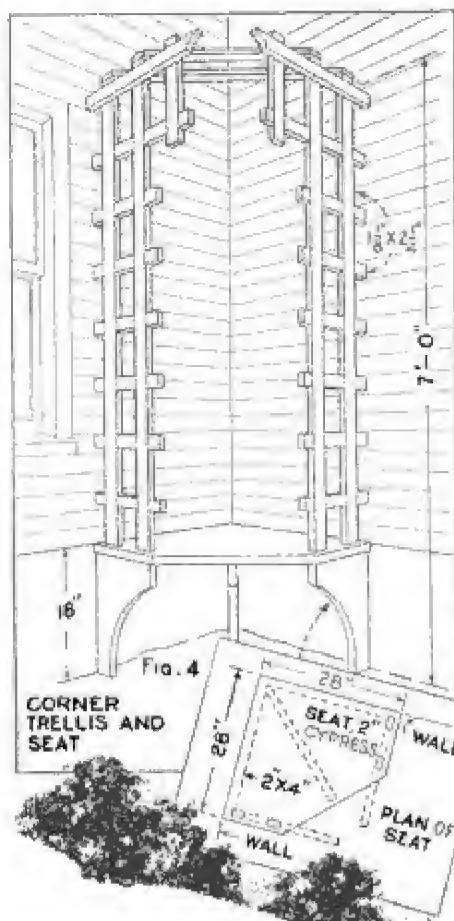


Fig. 2

needed for any purpose, these will usually be of cedar, which is likewise a suitable wood. Lattice is mostly of cypress, and comes in standard 1, 1 1/4, 1 1/2, 2 and 2 1/2-in. widths.

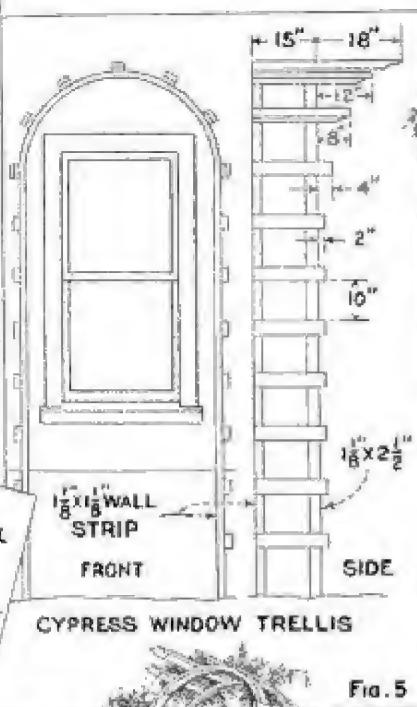
Remember when ordering your lumber that this always comes in even lengths, beginning at 10 ft., then 12, 14, 16, 18 ft., and so on, so that if you order an 8-ft. board, it will have to be cut from a longer one and you will pay for the cutting and for the waste material. It pays to figure a little before ordering the lumber for any job, to see that the stock will cut without waste, or that it can be





on centers each way. Still another, spanning a window, is shown in Fig. 3, and here the vertical strips should be carried down below the frost line, if they are allowed to go into the ground at all. However, they may be cut off about $\frac{1}{4}$ in. above the ground if desired, provided the trellis is well fastened to the wall, on 2

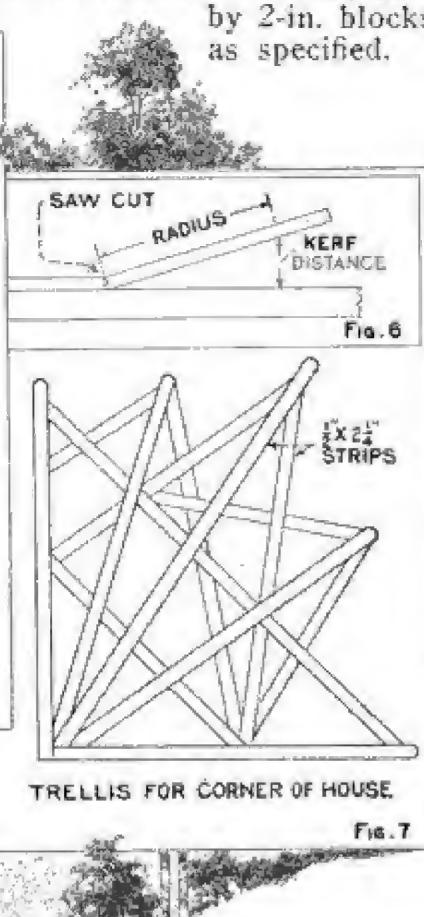
by 2-in. blocks, as specified.



mark the paint, but also allow the structure to fall apart after it has been up a year or two. When making joints in the wood work, slap a paintbrush full of white-lead paint on the joint before fastening the pieces together, to prevent moisture from creeping in and helping to rot the joints.

The simple wall ornament shown in Fig. 1 is made up from $\frac{1}{2}$ by $1\frac{1}{2}$ and 1 by $2\frac{1}{2}$ -in. cypress. The whole thing is assembled on the ground or in the home shop before erection, and then fastened to the wall with galvanized nails or brass screws, set into wood plugs, driven tightly into holes in the walls, if of brick. If the house is of frame construction, the wooden plugs are, of course, unnecessary, but 2 by 2-in. blocks should first be nailed to the wall, and the ornament fastened to the blocks. The important thing to observe in this, as in all lattice work, is to space the cross or lattice strips evenly. Unevenly spaced lattice work is apparent at once, and completely spoils the appearance of the finished work.

Another very simple trellis for the bottom of a low wall, or on which to train a small climber, is shown in Fig. 2. The strips here are $\frac{5}{8}$ by $2\frac{1}{2}$ -in., spaced 11 in.



TRELLIS FOR CORNER OF HOUSE

Fig. 7

An attractive design for an interior corner of a wall is shown in Fig. 4, and can be used either as a corner seat or as a stand for a flowerpot. Used either way, it makes a charming decoration. Full details are given in the illustration.

In Fig. 5 is shown an arch for the window, and here the amateur is likely to run up against his first hard job, in bending the arch strips. The strips can be bent, however, by steaming them for half an hour or so, or soaking them, where the bend is to be made, for the same time in hot water. Steaming is best. Failing the necessary apparatus for this, the strips can be bent by cutting as detailed in Fig. 6. First make a saw kerf in the piece, at the place where the arch springs, about as deep as it is thought the kerf should be. Measure from this a distance equal to the radius of the arch and make a mark on the strip. Now lay the strip down on the bench top, or on a level place on the sidewalk, and raise the end of the strip until the edges of the saw kerf meet. The distance from the radius mark on the strip

to the bench top, or sidewalk, will be the proper distance apart to make the saw kerfs. It will probably be found that cutting the kerfs half the thickness of the strip will be about right, but they must all be of uniform depth. The same method can be used for many other garden arches.

A trellis for the corner of the house is shown in

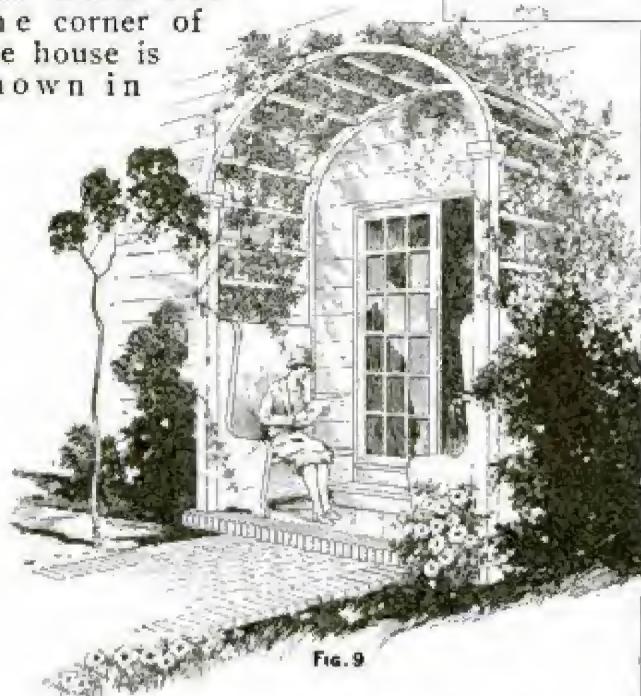


Fig. 9

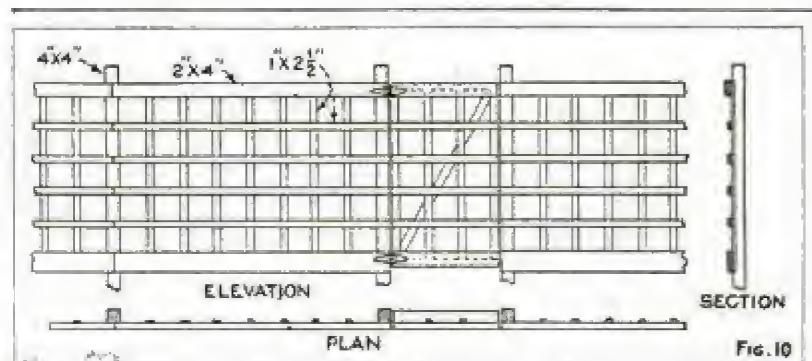


Fig. 10

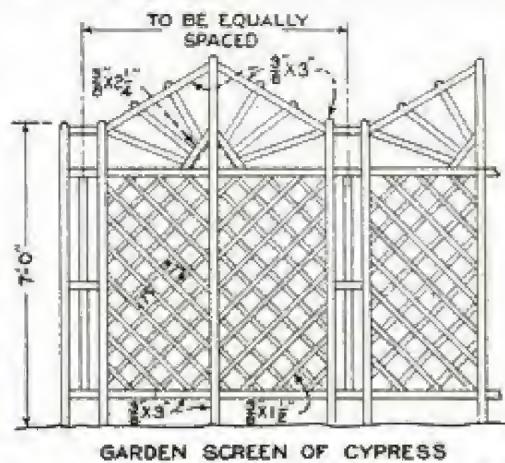


Fig. 8

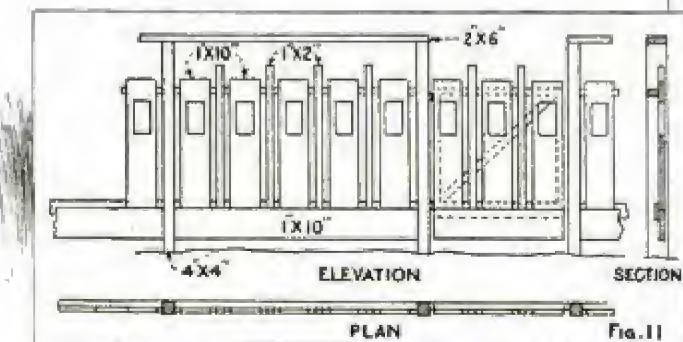


Fig. 11

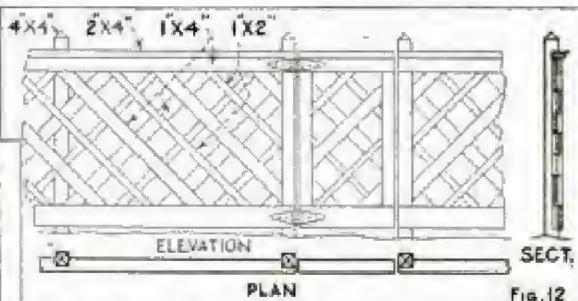


Fig. 12

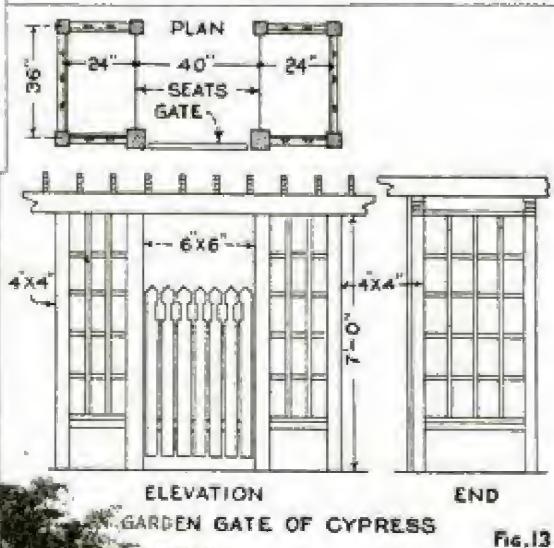


Fig. 13

Fig. 7. The strips here again are $\frac{1}{2}$ by $2\frac{1}{2}$ in., fastened to the house as were the others.

To screen off an undesirable view, or to divide the flower garden from the vegetable garden, the attractive screen shown in Fig. 8 may be used. No over-all dimensions are given for this, as these depend on the loca-

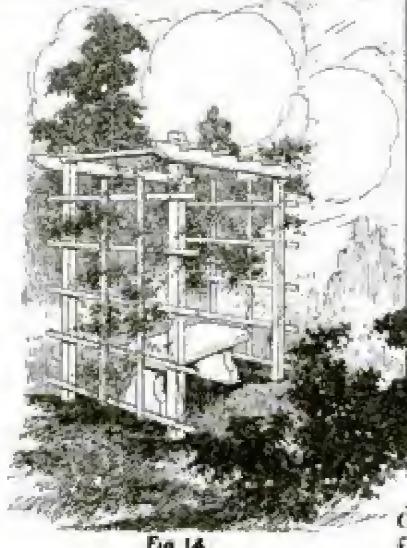


Fig. 14

tion. The spacing of the main members of the screen may be altered to suit the space at hand. This design may be modified in many ways; for instance, the triangular top work of the panels may be omitted, and the plain

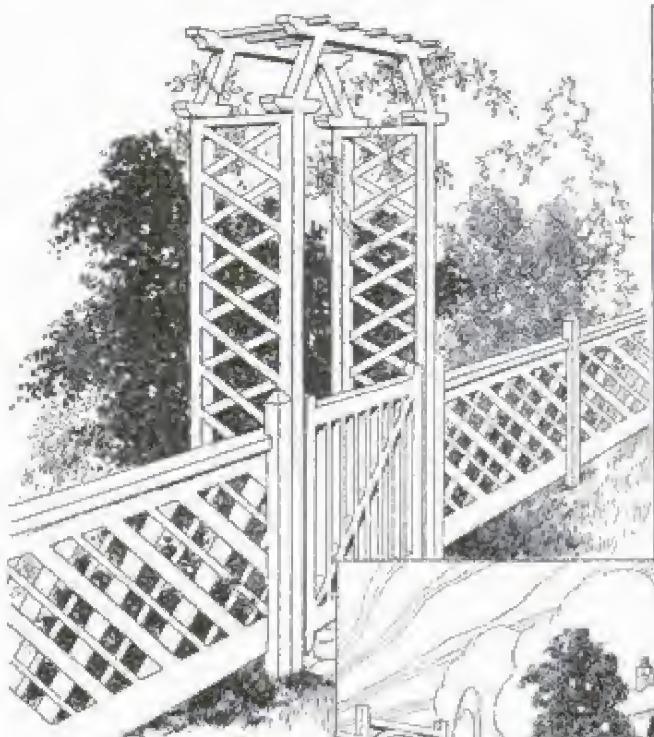


Fig. 15

lattice work instead carried up to within a couple of inches of the top of the vertical columns. The vertical members are $\frac{3}{8}$ by 3 in., on each side of the lattice work, and they should be sunk in the ground at least 4 feet. On all work of this kind, where the sections are of considerable size, the best job is done by setting the posts or vertical members in concrete. If this is undesirable, the soil must be packed solidly around them, and the structure should be temporarily braced to posts on the side until the fill has packed down hard and will support the structure solidly. This is especially necessary in the case of screens, as they, unlike arbors and trellis arbors, have no side support.

Leaving the back yard for the moment, Fig. 9 shows how the arch trellis can be applied to the front of the house. The benches can be made of pine or fir, and the whole makes a very attractive entrance for the cottage or the colonial type of small house.

Three simple and attractive fences for the garden are shown in Figs. 10 and 12. Here the important things to remember are to keep the posts exactly in line, and to place them such a distance apart that the stock selected will cut without waste and still come evenly on the centers of the

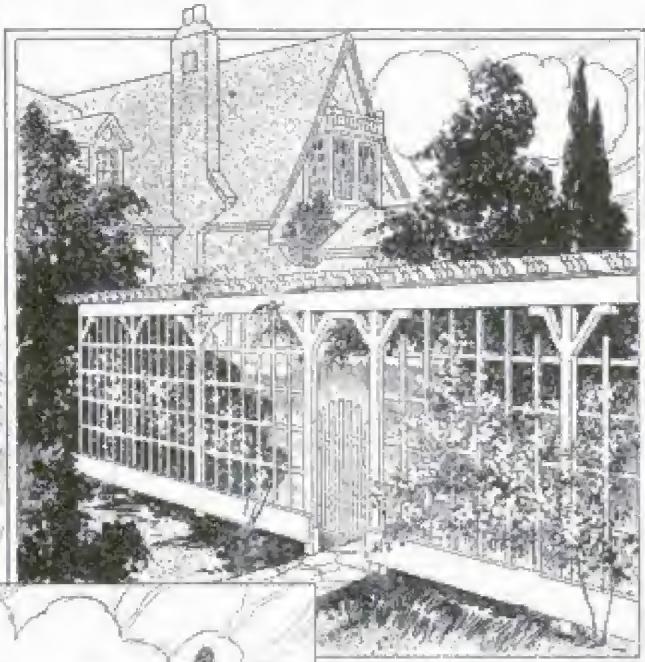


Fig. 16

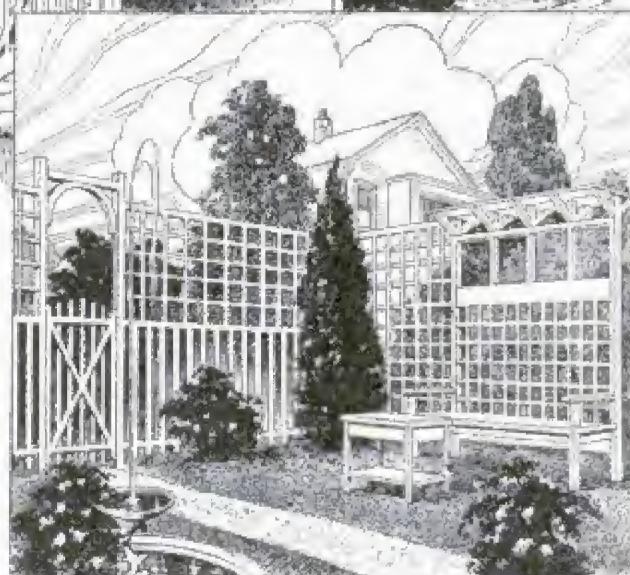


Fig. 17

posts. The best way to erect the fence is to set up the end posts first, plumbing them until they are exactly perpendicular and then stretch a line between them. Set the intermediate posts to the line and plumb them, and the fence will be right. This applies to posts for pergolas and long arbors also.

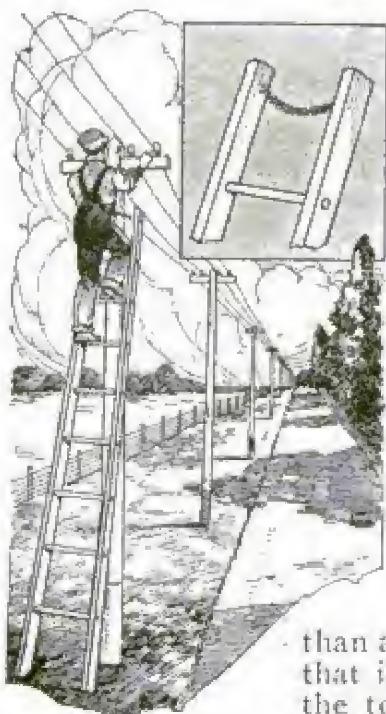
Fig. 13 shows a very attractive combination garden entrance and seat, but the same design, without the seat or gate, can be used in any part of the garden. The design can also be adapted for use as a pergola. I have not shown any pergolas using round columns, as these are rather expensive, and, in any event, if the reader wants a pergola of this type, he can easily get a design from the catalogs of houses supplying this material.

So much of this work depends on individual taste that only a few of the designs shown are fully dimensioned. The other sketches accompanying this article contain suggestions that will enable the owner to work out his own sizes and details. In general, the amateur will be well advised to stick to designs employing straight lines, and to avoid curves as much as possible. The ends of rafters of pergolas and arbors, etc., can be ornamented in several very simple ways as illustrated in the various drawings, with no more tools than a compass or keyhole saw and a brace and expansion bit.

Care of the Iodine Bottle

Using iodine as a first-aid application in cases of slight injuries has long been advocated. Every home shop should have a small quantity easily accessible so that even the smallest cut or scratch will not be neglected. The usual history of the iodine bottle is one of mishaps. When first bought, it is used and then placed on a shelf. Next it is tipped over a few times, which allows the iodine to devour the cork in a short time. Before long the cork does not seal the bottle but merely sits on top of it. This permits evaporation of the lighter parts of the liquid, and finally there is no longer a tincture but a thickened mass not fit for use. To overcome these conditions it has been found satisfactory in one large garage, to suspend the iodine bottle from a nail in the wall of the washroom by a short cord. It is always in one place and easily reached. It is not necessary to take the bottle down to use it. The cord allows it to be tipped. By hanging it up in this way the bottle cannot be upset and the cork will not be wetted with iodine.—Sherwood J. Gee, Montpelier, Idaho.

Ladder for Telephone Linemen

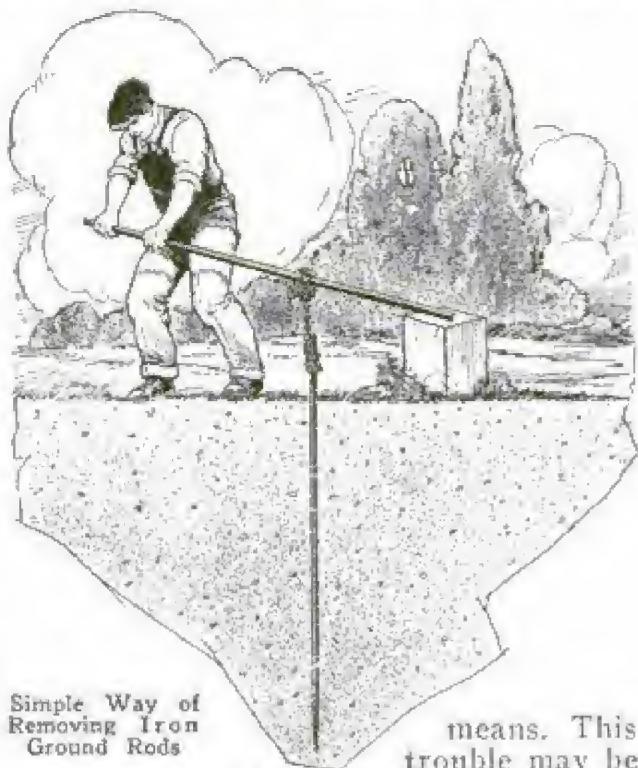


than a length of chain, that is substituted for the top rung of the ladder. The chain is attached to the stringers with eyebolts and a little slack is allowed so that it straddles the pole.

Do not apply furniture polish to soiled furniture, or it will never look bright; wring a cloth out of soapy water, and wipe the furniture carefully, then polish.

Removing Ground Rods

A ground rod, when driven into solid earth to a depth of 6 or 8 ft., usually resists any attempt to remove it by ordinary



Simple Way of
Removing Iron
Ground Rods

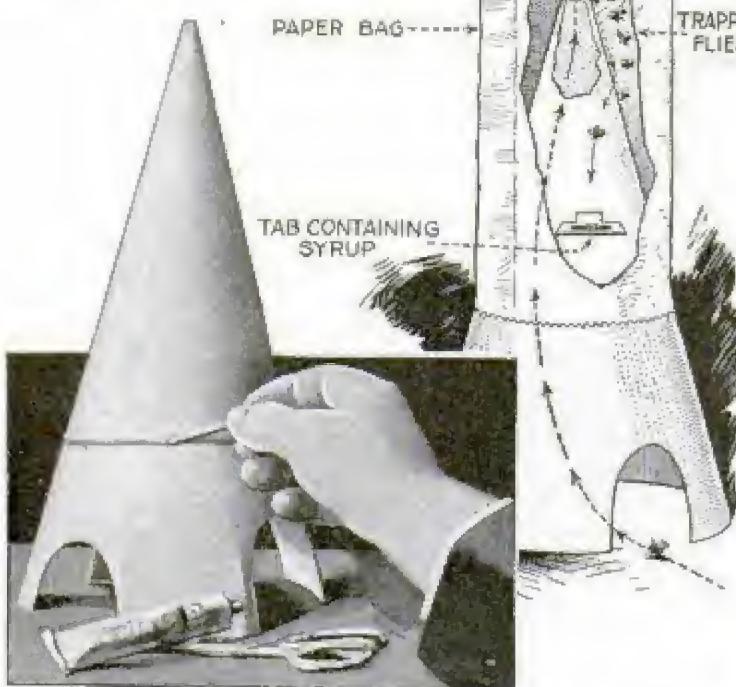
means. This trouble may be overcome with the aid of a crowbar and a trace chain. One end of the chain is fastened to the bar and a running loop on the ring end is slipped over the end of the ground rod. With the point of the bar resting on a solid support a foot or more above the ground, the rod is quickly started and removed by raising and lowering the bar a few times.—E. L. Goodwin, Warren, N. H.

Catching Drill Chips

When installing certain types of gas savers on the car, it is necessary to drill small holes in the manifold pipe. Care should be taken to see that none of the drill chips enter the pipe, for they might be drawn into the engine and lodge under a valve, causing serious trouble. Use of a stiff cup grease on the drill will hold the chips very well and keep them from getting into the engine. Through the entire drilling operation, the drill should be coated with grease in case the drill should penetrate faster than expected. But, if possible, this should be wiped off and a fresh coating applied just before the drill goes through the metal. It is well to cool the drill by dipping it in cold water before applying the final coating. After drilling, cup grease is used on the tap also. Magnetizing both the drill and the tap will add safety to the operation.

Fly Trap Made of Paper Is Efficient

The paper fly trap shown here is efficient, easy to con-



Cheap Paper Fly Trap Proves Effective and Can Be Burned after Use

struct, inexpensive and may be burned after it is filled with flies. It consists of a cone made of heavy wrapping paper. A small hole is left in the pointed end. The cone is trimmed even at the base and doorways provided as shown. A tab, coated with sirup to attract the flies, is glued about halfway between the top and bottom on the inside, and glue is brushed around the outside on a line a short distance below the tab. A paper bag of suitable size is placed over the cone and its opening pressed against the ring of glue to hold it in place. It is obvious that the flies, attracted by the sirup, will enter the doorways, pass through the small end of the cone and are then unable to escape.

Kinks for the Auto Tourist

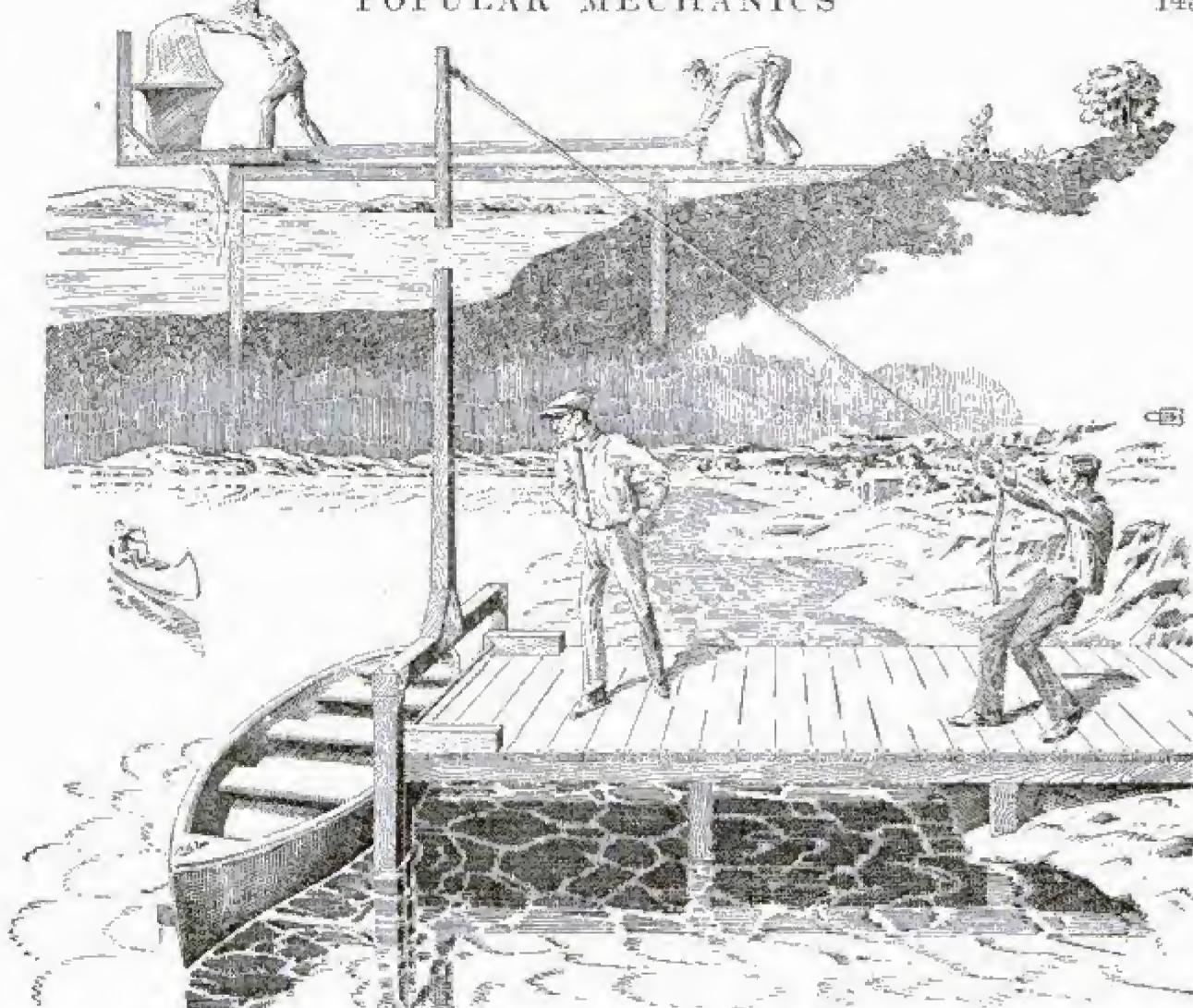
If you are in doubt about which road to take while touring let the telephone wires be your guide. Telephone wires lead to the cities and towns, and the tourist need have no fear of going wrong if he follows the road having the most wires. If you wish to light a camp fire and discover that you have no matches, disconnect a spark-plug wire at the plug, saturate the end of a stick or cloth with gasoline and hold it between the spark plug and the end of the wire so that the spark will light the gasoline. A good place to carry spare grease is in the rear hub caps.

Most light cars have no need for grease at this point, but it is a convenient place to carry it on those long drives when every bit of space counts. You do not always need to use the extra fan belt or light bulbs, but when you need them they are worth many times their cost; so be sure to have an extra one with you. Do not carry suitcases, etc., between the hood and the front fenders on a new car, as the varnish will soon be worn off by rubbing against the baggage, but secure them to the running boards. Don't forget to include a couple of wooden blocks or boards in the camping equipment, as they come in handy if you get into a mud hole. If your lights suddenly flare up and go out, do not install new ones until you have looked over all connections to the battery, making sure that they are tight; then do not install the lights with the motor running, for the generator may have burnt out the lights owing to a loose connection. You will generally find this loose connection at the battery terminals. Make sure of this by trying your starter. If it does not work, your battery connections are loose. If it does work, examine the connections at the junction block, ammeter or switch. Don't take it for granted that the battery connections are tight but tighten them as much as possible with a wrench or pair of pliers. Pay particular attention to the ground connections.

Mowing Heavy Grass

When lawnmowers are crowded to cut thick and heavy growths of grass, the stationary cutting bar and supporting roller frequently jump or "buck," leaving unsightly patches of long grass here and there about the lawn. By attaching the spring-and-roller device shown in the drawing, this trouble is readily overcome. The main leaf from a discarded wagon-seat spring





Convenient Hoist for Raising Rowboats and Canoes Is Attached to the Dock and Can Easily Be Operated by One Man

is bolted to the underside of the mower handle so that the two small wood disks, or wheels, mounted on the free end of the spring, will rest upon the wood roller of the mower when the handle is pressed down. In ordinary use, the spring plays no part, but when the mower is driven into rank grass, the handle may be held low enough to bring the rollers in contact, thus holding the rear part of the mower against "bucking."

Matches Save Ferns

If your potted ferns seem to wilt and die from no apparent cause, it is likely that they are being attacked by small worms that feed on the roots. A good remedy for this trouble is to bury a number of sulphur matches in the soil about the roots as shown in the illustration. The moisture will disintegrate the sulphur in the matches and this will kill or drive off the worms effectively.—C. M. Wilcox, Torrington, Connecticut.



Novel Boat Hoist

Where a great many boats or canoes are kept a boat hoist of the kind shown in the drawing will prove very useful. The hoist is made of 4 by 4-in. lumber and consists of a cradle, which is submerged so that the boat can be driven over it, and a lever, which extends vertically from the cradle and is pulled down to raise the cradle above the surface of the water. To permit this, the hoist must be pivoted on the edge of the dock as indicated. The pivot is a $\frac{3}{4}$ or $\frac{5}{8}$ -in. iron rod extending through the frame and also through two 4 by 4-in. blocks, securely bolted to the dock. A rope is attached to the top of the lever so that it can readily be pulled down. A large screw eye is driven into the dock for fastening the rope.

A paste for cleaning greasy and inky hands can be made by pulverizing a cake of scouring soap and mixing it with a cup of hot lard. Stir well, and when it is partly cool, pour into a container. This is an ideal soap for printers, blacksmiths and auto mechanics.

Shading the Sand Pile

In many backyards there is no tree shade, and if there is a sand pile for the youngsters, they must play in the sun



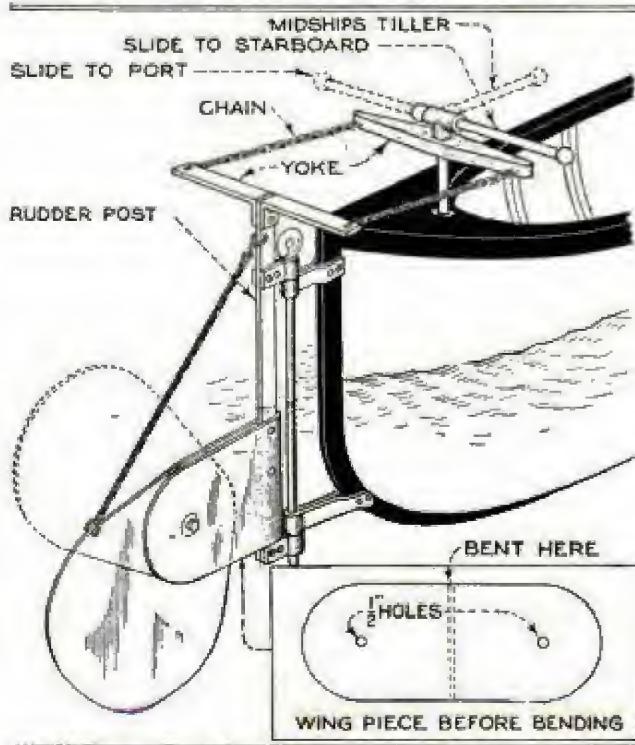
Sunshade over Sand Pile Protects the Children from the Heat

most of the time. The photo shows a small sand pile, confined within a frame 4 ft. wide and 6 ft. long, with a muslin-covered roof. The roof comes to within a foot of the ground at the ends and the center is $4\frac{1}{2}$ ft. high. After the muslin was sewed together and tacked in place, light strips of wood were nailed down over the edges to prevent it from being torn off.

Making a Drop Rudder

There is nothing like a drop rudder for a sailing canoe or rowboat, and although it may seem difficult to rival a manufactured job, it is an easy matter to make one at much less cost that will answer the purpose just as well. The material used is galvanized sheet iron; stock of $\frac{1}{16}$ -in. thickness is heavy enough for the biggest boat on which such a rudder is likely to be used. The exact dimensions, shape and weight of the material depend, of course, on the size and model of the boat. The blade is cut to the shape indicated, making sure that it is per-

fectly straight, and the edges are then smoothed off nicely. The rudder post is a length of $\frac{1}{4}$ -in. flat steel, about $1\frac{1}{2}$ in. wide. To the lower part of this post a wing piece is riveted as indicated, a $\frac{1}{2}$ -in. hole being drilled through it in the center of the round end, and the blade riveted between the wings so that it can move up and down rather stiffly. The application of a little heavy oil or graphite grease will make it work with sufficient freedom without becoming too loose. The rivet may be a short piece of $\frac{1}{2}$ -in. steel rod or a short $\frac{1}{2}$ -in. bolt. A hole is also drilled in the blade to receive the rivet and it should be enlarged to about $\frac{3}{4}$ in. in diameter, and a brass or iron washer, a trifle thicker than the blade, is filed down to a force fit in this hole and reamed out to fit on the rivet. To limit the downward swing of the blade a length of furnace chain is attached to the top and to the rudder post. To mount the rudder, the stern and rudder posts are fitted with eyes of flat steel, placed as indicated, so that the rudder cannot move up or down on the rod by which the assembly is held together. Removal of this rod allows the rudder to be taken off and lifted into the boat when desired. The steering gear may consist either of a simple yoke of strap iron riveted to the rudder post and moved by tiller ropes, or a double yoke, connected by chains and moved by a sliding tiller, the latter arrangement being more "shipshape." If the boat has a curved stern, the rudder post should be curved to correspond, except that part to which the wing piece is attached, and the locking rod must, of course, also be curved. The lower rudder and stern post must then be attached immediately above the wing piece.—Howard Greene, Washington, D. C.



Detachable Drop Rudder for Sail and Rowboats

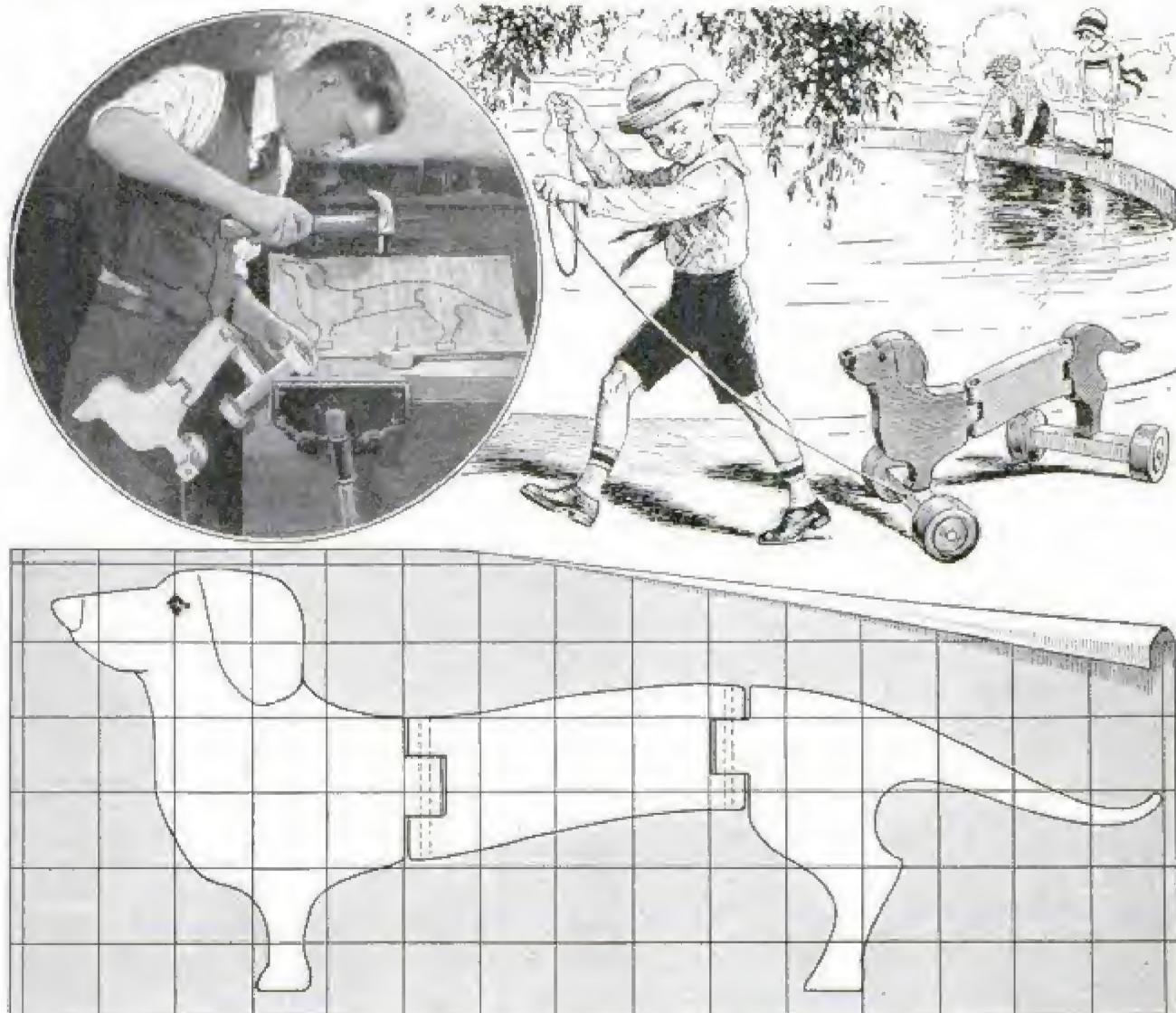
An old-type auto sidelight makes a good lamp for backing up at night. Placing it in the center of the tire support will be found to be about the most convenient location.

How You Can Make a Wiggling Pup

By B. VAN BUREN

ANIMATED wooden toys on wheels are very popular, and are much enjoyed by children. The construction of the wiggling pup is simple and will prove an interesting pastime; the youngsters also will like it so much the better because some one of their own family made it. The feature of the toy is its jointed body,

board, or the tail will be easily broken off when it receives the more or less rough handling a child is certain to give it. Then, with a fretsaw, cut out the outline very carefully. After each section is cut out, round off the corners at the joints, drill holes through them as indicated and sandpaper the surface until it is smooth



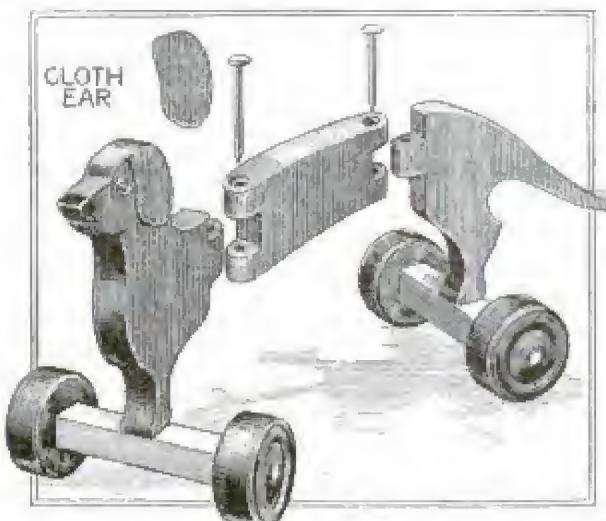
Simple Design for a Toy Pup Made of Wood and Having Flexible Joints; the Work of Assembling and Painting It Can Easily Be Done in an Hour

which causes it to dart from side to side as it is pulled along on the floor.

Any close-grained wood can be used, such as poplar or white pine. A piece of $1\frac{1}{4}$ -in. stock, 6 in. wide and 15 in. long, is all the wood required to make it. First lay out the pattern on a piece of paper of that size, laid out in 1-in. squares, using the design in the accompanying illustration. Then get some carbon paper and trace the design on the wood after this has been well planed. Take care that the grain of the wood runs lengthwise of the

and ready for the application of paint or enamel. The axles can be made of the same stock; they are about $\frac{3}{4}$ in. square and 5 in. long. They are screwed to the feet, holes being drilled first to prevent splitting the wood. Almost any kind of wheels can be used and they are fastened to the axles with wood screws or nails, leaving them loose enough to turn easily. If one has access to a wood-turning lathe, neat wheels of the same thickness as that of the body of the pup can be turned out. A small hole is drilled through the center

of the front axle for a string to pull the toy with. Get the joints to work smoothly before applying paint or enamel. By using a file on the flat surface and then



Details of Wiggling Pup, Showing Pivoted Joints and Cloth Ears

rubbing a little vaseline or hard oil on them, they will work very smoothly.

The natural color of the dog, which represents a dachshund, is black or brown. Glossy enamel will be found most effective on toys, and three coats of colored lacquer will give a good finish. However, if paint is handy, it can be used, and then a glossy finish can be had by applying a coat of varnish. Black for the axles and a bright red for the wheels will be pleasing to children. The wheels should, of course, be finished separately, and when they are put on the axle, an iron washer should be used to reduce friction between the wheel and the axle. The ears can be cut out of a piece of brown or black felt and are glued or tacked on. Nails are used for pivots on which the joints move and are cut off so that they will not project under the body. It is a good idea to counterbore the pivot holes at the top to take the nail heads.

Lubricating Keys



It is not a new thing to use graphite for lubricating the key in a lock to eliminate the grind of the metal surfaces against each other, but many believe that only powdered graphite should be used for this purpose. I recently met three men who were in the

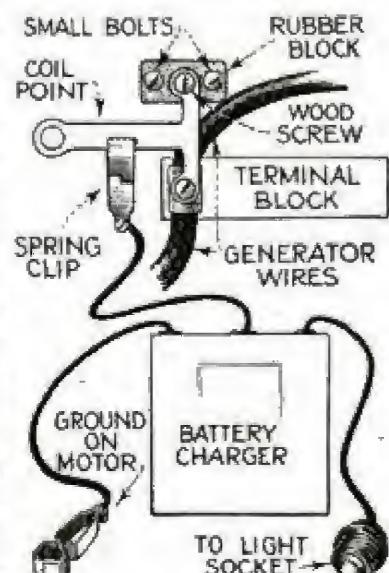
locksmith business, trying to lubricate a Yale-lock key with lubricating oil. When corrected and told to use a lead pencil for lubricating purposes in such instances, they were surprised that they had not thought of that before. There are many times when thin keys stick in the lock and give trouble, and a lead pencil stroked over the surfaces of the key will often eliminate the trouble.—Harry E. Gifford, Medford, Mass.

Testing Butter

If in doubt whether you are getting genuine butter or oleomargarine, you can settle the question by the following test: A level spoonful of the substance is held above a gas flame, and if the contents shows a sort of foam when heated it is real butter. Otherwise, the cow had no part in its manufacture.

Charger Connection for Ford

For a portable battery charger, a contact can be attached to the generator wire under the hood on a Ford car, the generator wire being used instead of the battery wire, because it is at the end of the terminal block and also because the charging rate will be shown on the ammeter of the car. The charger can be connected by simply raising the hood and attaching the positive clip to the generator wire and the negative clip to the cylinder-head screw, or some such part. This is much more convenient than raising the floorboards or the turtle back and connecting the charger directly to the battery. An upper point from a discarded Ford coil can be attached to the screw on the terminal block of the generator to extend beyond the end of the terminal block to facilitate attachment of the wire. If the car has a wooden dash, a wood screw and a short piece of tubing can be used to steady the upper end of the coil point. On a metal dash, use a piece of insulating material cut from a dash terminal block and fastened

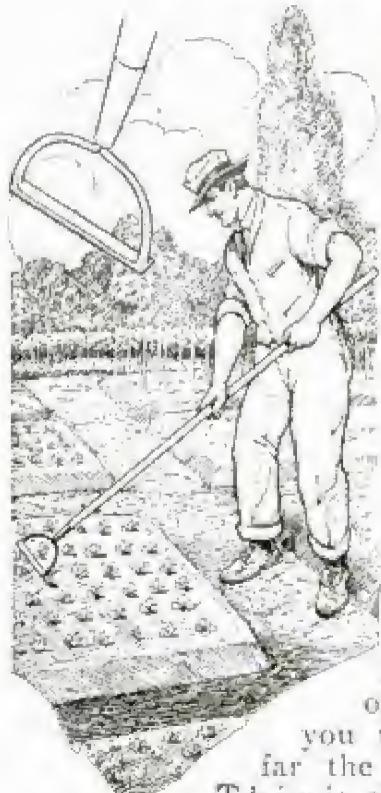


to the dash with two small screws. Part of the lower edge of the coil point should be filed away to clear the upper edge of the terminal block and allow the ear on the point to come down far enough for the terminal-block screw to be replaced.

Cleaning Burnt Cooking Utensils

The black crust formed on the bottom of cooking pots and sauce pans by burning can readily be removed by first placing the vessel upon the stove and allowing it to heat thoroughly. Then cover the bottom with vinegar and add a teaspoonful of soda. Let it boil for several minutes, then empty the vinegar and remove the softened crust with a scraper.

Novel Garden Hoes



Some years ago a friend of mine had several hoes made of the kind shown in the drawing. They are especially useful while the plants are still very small. With this type of hoe you can work right up to the plants without any risk of injuring them, as the manner of attaching the blade to the handle with an open fork enables

you to see just how far the hoe is cutting.

This is almost impossible with the ordinary tool, especially when hoeing around small plants.—H. H. Siegele, Emporia, Kans.

Homemade Tray for Storage Battery

When placed upon the floor or table, storage batteries often cause acid stains of a more or less serious nature. This trouble can be prevented as follows: Obtain a shallow cardboard box, somewhat larger than the battery, and give the interior a liberal coating of rubber cement. When dry, this will provide an acid-proof and non-leaking receptacle for the battery.

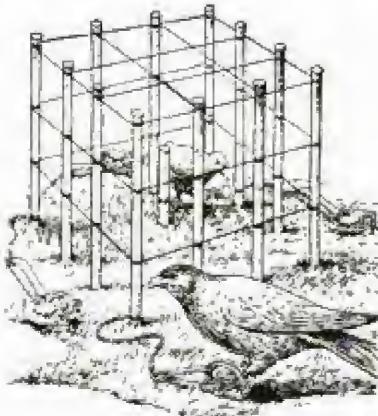
Non-Slip Diving Board

The slippery surface of a wet diving board is often the cause of injury to swimmers, so the manager of a lake resort devised a very simple and practical method for making the boards at his beach slip-proof. A number of rubber bands, about 2 in. wide, were cut from discarded inner tubes and snapped over the board, spaced about 1 in. apart. This provides enough friction to prevent the divers from slipping.—G. E. Hendrickson, Argyle, Wis.



Effective Crow and Hawk Trap

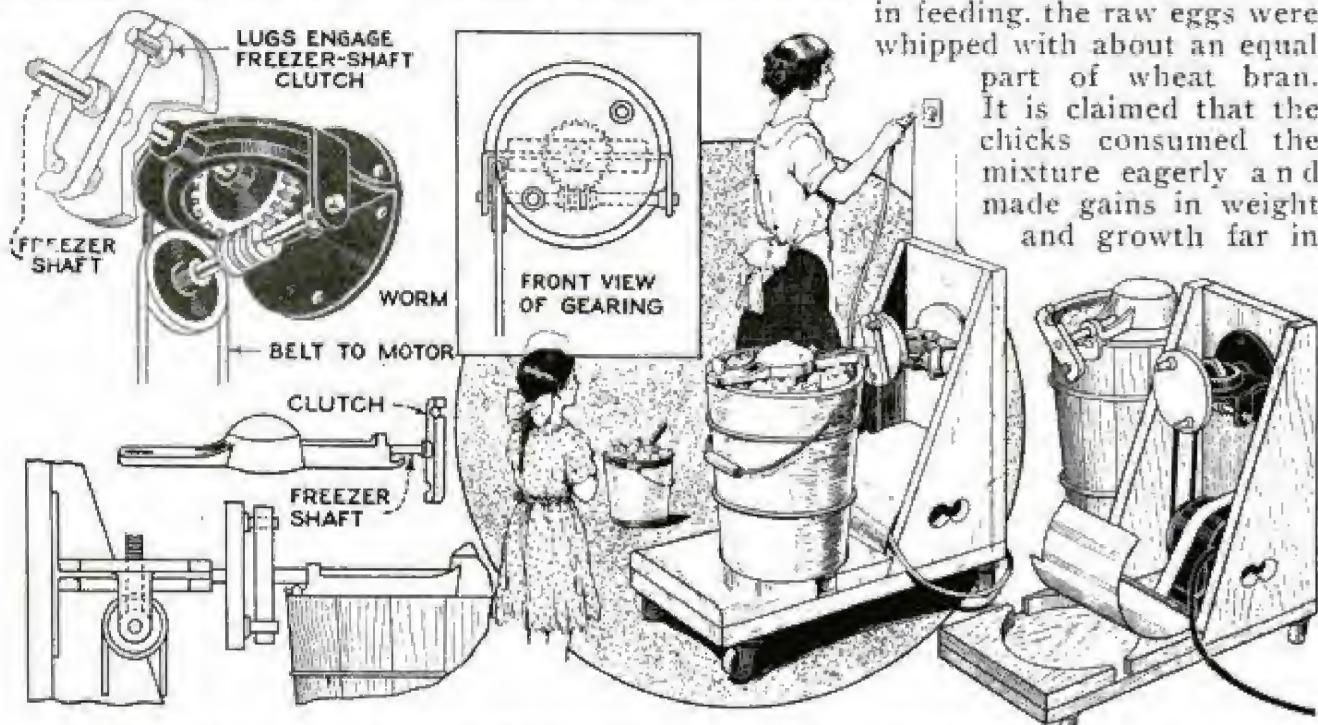
For trapping crows and hawks the method shown in the illustration has been found successful. In an open meadow twelve stakes are driven into the ground and left projecting about 1 ft.; they are spaced 4 in. apart. A small stake is driven into the ground in the center of this pen and a small chick is tied to the stake as a decoy. The sides and top are covered with light baling wires run back and forth to form a 4-in. mesh. A number of steel traps are then set outside of the pen. When the crow or hawk pounces down upon the chick the wire mesh throws it off, usually landing it with its claws in one of the traps, and it is impossible for it to get at the chick even if it isn't caught.



This method has been used with great success.—Hugo Glitzke, Tonganoxie, Kans.

Changing the Ice-Cream Freezer for Motor Drive

Those who have had the experience of turning an ice-cream freezer occasionally,



Homemade Electric Ice-Cream Freezer Mounted on Truck Saves Much Time and Work; Details of Driving Gear and Clutch That Takes Place of Hand Crank

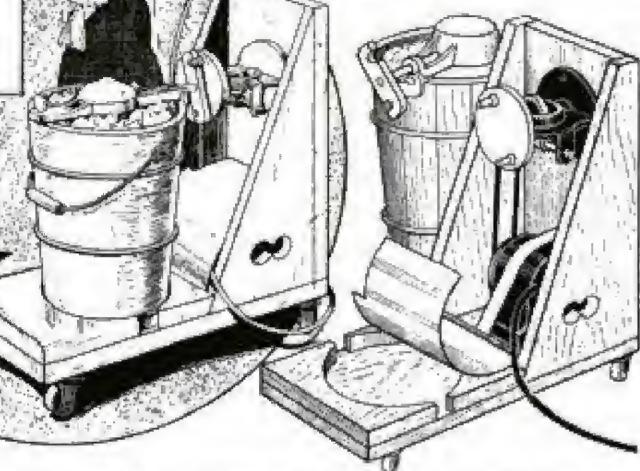
will appreciate the usefulness of the motor-driven outfit shown in the drawing. Both freezer and motor are mounted on a wooden truck, provided with casters so that it can be conveniently rolled around. A frame is built at one end to support the driving gear. The freezer itself is of the hand-crank type, but is adapted to the motor by removing the crank and substituting a wooden flange to which a worm gear is fastened, and a small belt is run from the motor to the worm gear to drive it. A $\frac{1}{6}$ or $\frac{1}{4}$ -hp. motor is strong enough to turn a 6-qt. freezer. A sheet-metal cover should be made, to shield the motor from water and ice. In use, the freezer is filled in the usual way and the truck then wheeled to a position near a wall socket so that the extension cord can be attached. In less than 30 minutes the ice cream will be ready to serve.—Mrs. H. T. Hixon, Auburn, Ala.

Raw Eggs for Baby Chicks

In experimenting with the feeding of baby chicks a Wisconsin poultryman has found that the common practice of feeding them hard-boiled eggs for the first week or so does not bring about the results in growth and development that are obtained when the eggs are fed in a raw state. The tests were made on the theory

that since nature supplied the chick with raw egg as its first food the delicate digestive organs of the young bird should be better able to assimilate this than a cooked egg. To overcome the difficulty in feeding, the raw eggs were whipped with about an equal part of wheat bran.

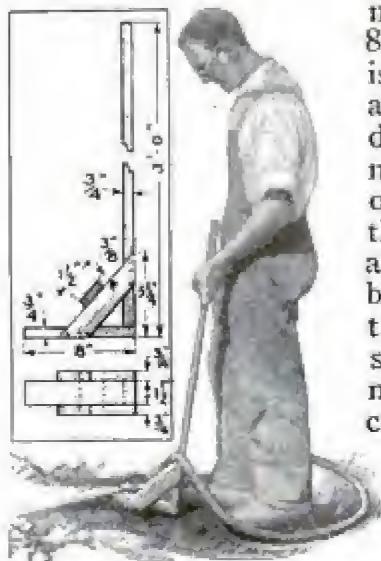
It is claimed that the chicks consumed the mixture eagerly and made gains in weight and growth far in



excess of those fed in the regular manner.—G. E. Hendrickson, Argyle, Wis.

Hose Attachment Sweeps Leaves from Lawn

Although built from scraps of wood, the hose attachment illustrated is very efficient in removing leaves from a lawn, as the stream of water is easily directed over the surface. Laid back on the handle, the device is also useful as a sprinkler. Cut a handle, about 3 ft. long, of 1 by 2-in. stock, and nail to one end an 8-in. length, which is braced at right angles to the handle by a strip nailed diagonally on each side. A thin strip tacked across these braces completes the device. In use, slip the hose nozzle under the cross strip until it lies at the bottom of the angle, as indicated.



How to Repair a Slit Tube

When an inner tube bursts, the result is often a slit a few inches in length, which, if repaired with a patch on the outside in the ordinary manner, is likely to extend beyond the ends of the patch after a little more running. The tube may be repaired in a satisfactory manner, however, in the following way: At each end of the slit, cut a small round hole, and turn the inside edges of the slit out so that they can be cleaned. Then insert and cement a patch on the inside of the tube, and cement the usual patch on the outside.

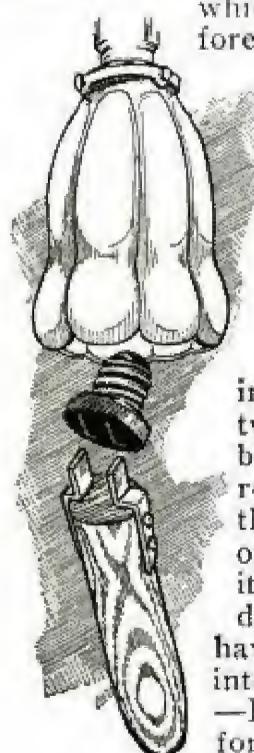
A tube with a $4\frac{1}{2}$ -in. slit was repaired in this manner, and has since run over 600 miles without any sign of trouble developing.

Inserting Electric Plugs

In many homes electric appliances are attached to sockets having glass shades, which must be removed before the plug can be screwed in, as the hand is too large to enter the glass shade.

Most plugs are separable, one part being threaded and the other part having two prongs, which are inserted in slots in the first part. To eliminate the necessity of removing the shade, I attached two short strips of sheet brass to the end of a short round stick, placed the threaded part of the plug on the prongs and screwed it in place. After this is done, the part of the plug having prongs can be pushed into place without difficulty.

—Harry E. Gifford, Medford, Mass.



Killing Flies

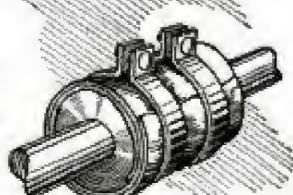
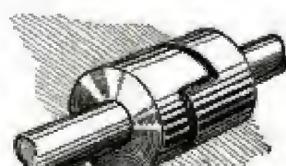
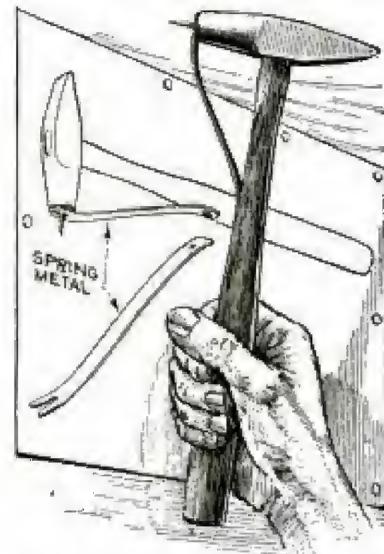
One objectionable feature of a fly trap is the killing of the flies with hot water. Fasten a can to the inside of the trap, fill it with water, and hang a sheet of poison fly paper over the edge of the can, one end of the paper in the water. The flies are sure to drink from the moist paper as there is no other source when they become thirsty. The dead flies are readily dumped out without the inconvenience of first killing them.—Gordon H. Sears, Salt Lake City, Utah.

Spring Aids in Driving Tacks

In making fly screens and screening in a porch my fingers were quickly bruised in starting the tacks, so I conceived the idea shown in the illustration. I first took a strip of tin to try the scheme and after finding it successful, I made a permanent one out of an old corset stay. A notch was filed in the latter and a hole punched at the other end, through which the spring was tacked to the hammer handle, as shown. The spring is turned to one side after starting large tacks or small nails for driving but for small tacks it is left on the face of the hammer. If a hammer having two faces is used, it can be reversed for driving.—G. M. Beerbower, Tarrytown, N. Y.

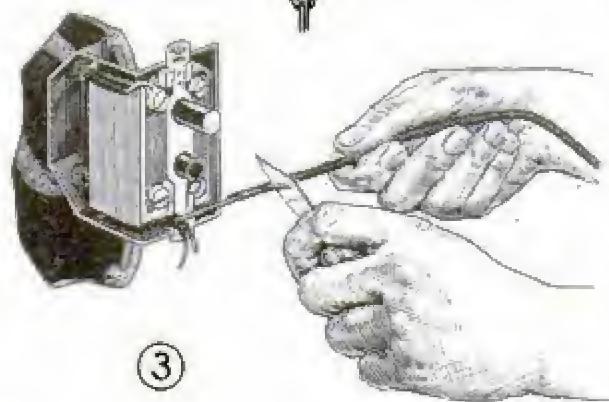
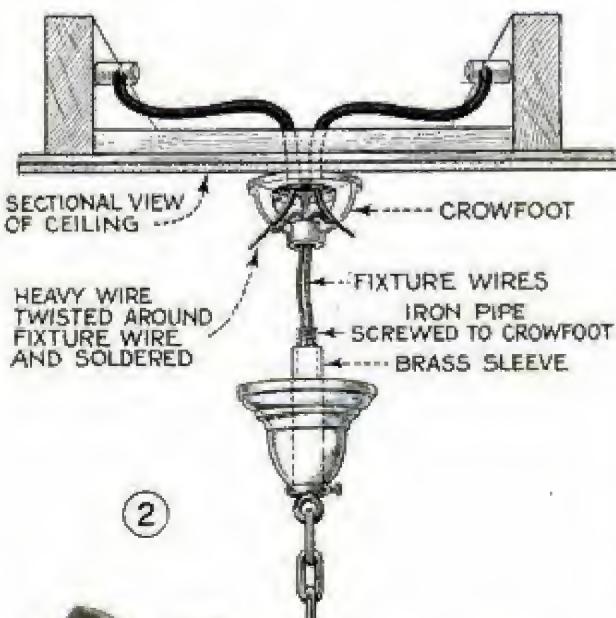
Noisy Jaw Clutch

There is a type of coupling used on many automobile engines for the purpose of driving the pump, generator or magneto, which is known as a straight-jaw clutch or Oldham coupling. After considerable wear, play occurs between the two halves of the coupling, and this play usually adds to the many noises which develop in an engine. From a discarded inner tube, cut a strip of rubber, long enough to wrap around the junction in the coupling twice and about 2 in. wide. Place two hose clamps side by side around the rubber and set the nuts tight on the clamping bolts. On some engines where the coupling is badly worn, it is suggested to remove it and to slip a piece of hose onto the shaft ends, holding it in place with hose clamps and letting the drive go through the hose.



Hanging Electric Fixtures

By E. R. Haan



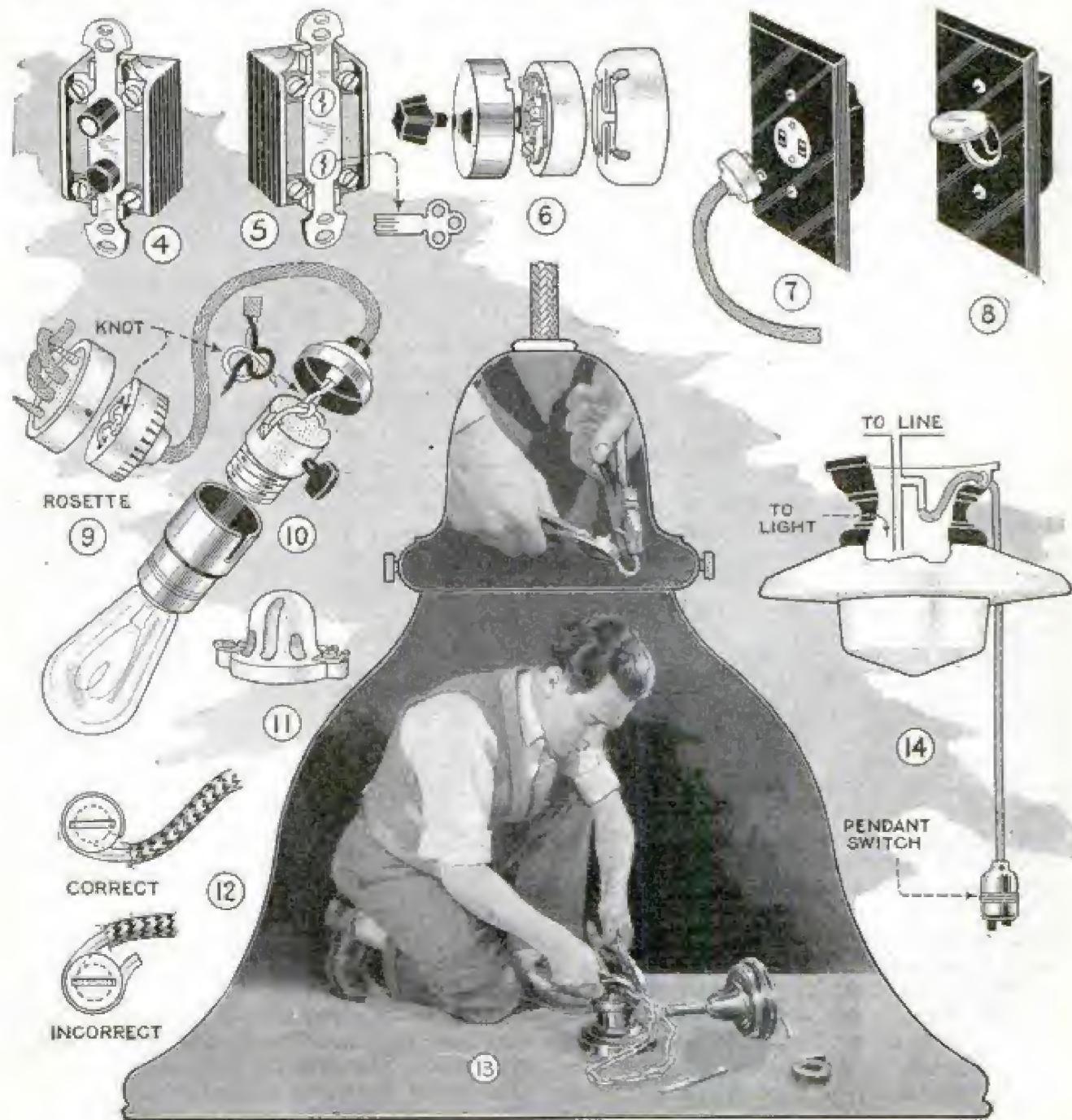
FIXTURE hanging is the task that remains for the home electrician after he has completed the wiring, as described in the May and June, 1926, issues of Popular Mechanics Magazine. For the living and dining rooms, library, halls, etc., more or less elaborate fixtures will add much to the appearance of the home, while ordinary drop cords with keyless sockets are sufficient in bedrooms, and key or pull-chain sockets in closets. Most fixtures consisting of more than a rosette, cord and socket, have an iron crowfoot, which is first screwed to the ceiling, the screws projecting into the fixture-support board previously nailed between the joists, as shown in Fig. 2. The ends of the fixture cords are bared and are pushed through the tapped hole of the crowfoot so that connection can be made with the outlet leads. The latter are twisted around the fixture cords, which makes the connection strong mechanically. Then the connections are soldered and taped. A good wrapping of tape is essential, as the sharp ends of the wire might puncture a layer of tape, and in case the wires of both connections should touch the metal bell of the fixture, a short circuit would result. The short length of pipe is then screwed into the crowfoot, and the bell is pushed up against the ceiling and fastened there by tightening the setscrew, as shown in Fig. 1. In some cases it is necessary to reduce the length of the chain on fixtures so that they will hang at the right height. This is done by taking two pairs of pliers and opening the links which are to be removed, as shown in Fig. 13. By doing it as indicated in the insert, the links can be opened without marring them.

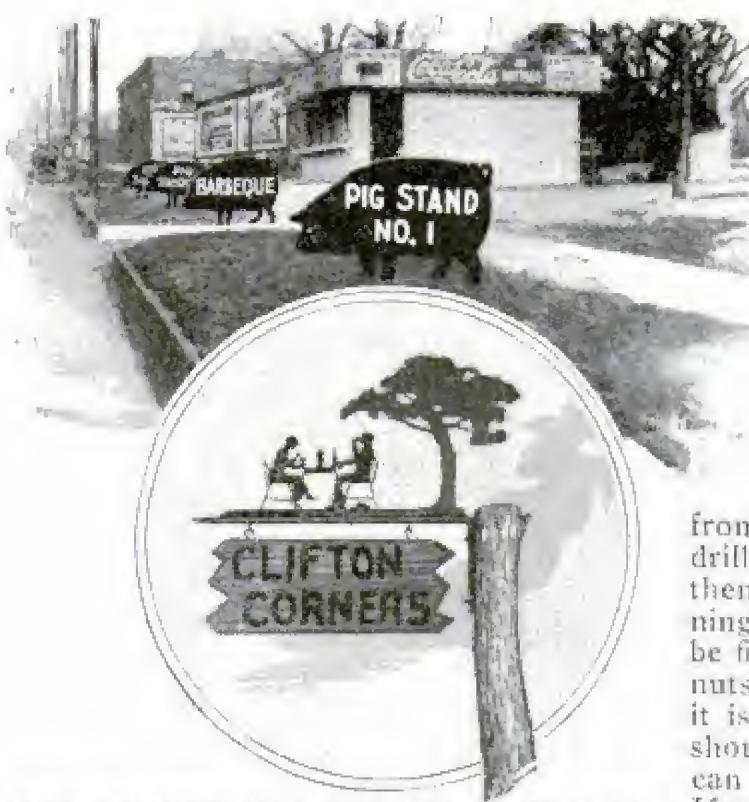
The installation of flush switches is shown in Fig. 3. The rubber-covered leads are pulled out of the box and the switch is fastened in place. The wires are then bared, up to the screw to which they are to be attached, and are twisted around it under the head, which is then driven down tight. There is a correct and incorrect method of twisting wire under screw-heads, as shown in Fig. 12. The wire should always be wound around the screw in the same direction as the threads. If it

is wound around the screw in the opposite direction it will tend to loosen. Two types of flush switches are shown in Figs. 4 and 5, the latter being of the key type, which makes it impossible for anyone to meddle with it. A snap switch with an extra porcelain base is shown in Fig. 6, the base being used only in exposed wiring, such as in basements and barns. As direct outlets for lamps, washing machines, electric irons, etc., the flush plugs shown in Figs. 7 and 8 are used. When wiring these, be sure that the wires do not touch the metal switch box, or there will be a short circuit. After the plug has been connected, the plate is screwed on.

When making drop cords, use a porcelain ceiling receptacle of the separable type shown in Fig. 9. The base is first

screwed to the ceiling and connected. A length of lampcord is connected to the other part of the rosette and a socket is attached to the other end of the lampcord. Knots of the kind shown in the detail prevent strain on the screws to which the bared ends of the lampcord are connected, so that short circuits will not occur, and generally make the cord more durable. For exposed wiring, the ceiling receptacle shown in Fig. 11 will be found convenient. If you have a direct outlet with a key socket and wish to change it to a ceiling fixture, a pendant switch on a length of lampcord, as shown in Fig. 14, should be used unless a wall switch is desired, in which case some additional wiring has to be done, as explained thoroughly in preceding articles.





Novel and Easily Made Signs That Attract Trade without Being Objectionable

Novel Signs Attract Business

Signs of the type shown in the illustration are often unobjectionable on highways where other kinds of signs would be thrown out by order of the police. The pigs shown in upper photo, which announce the approach to a barbecue stand, are cut from heavy tin and painted black. The first pig, from either approach, announces "Pig Stand No. 1" is just ahead. A herd of a dozen tin pigs are spread twelve feet apart before the stand. Each pig has a different message to tell. One tells of a hamburger, another of barbecued meats and a third announces soft beverages.

The pigs are life-size with the realistic curly tail up over the back. It is a unique form of telling the public what the merchant has to sell, and the very novelty pleased rather than raised objections, such as some signs would provoke if placed along the parkway.

Pictures from a magazine, traced on tin and cut in silhouette, and letters cut from advertisements and pasted on a board, served to make another neat sign for a country tea garden just a few miles outside of Kansas City. The picture was from an advertisement setting forth the refreshing qualities of a certain well-known soft drink. Cut in tin and mounted on a stout baseboard, which was bolted to an angle and then mounted on a post, the sign was artistic and attractive. The picture sets

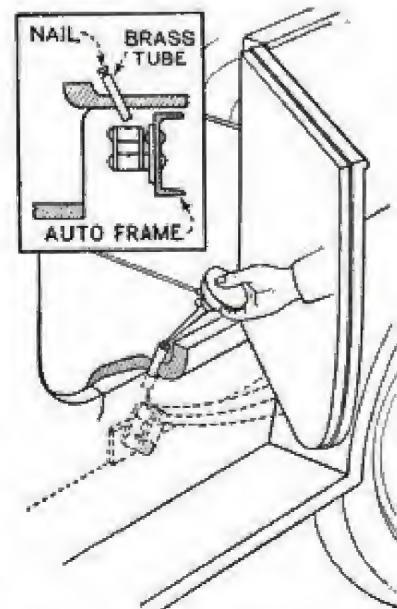
forth emphatically the main item the merchant has to sell. The letters pasted on a plain oak board, give the name of the stand. The post set in the ground is solid and in harmony with the entire layout. —C. N. Cook, Kansas City, Kans.

Shoe Scraper for Car

Farmers and others who are forced to walk to and from their cars in heavy mud will find that a scraper fitted under the running board is a great convenience. An effective scraper can easily be made from a strip of 1 by $\frac{1}{8}$ -in. steel, bent and drilled to form a U-shaped stirrup, and then screwed to the underside of the running board. If desired, the scraper may be fitted with round-head bolts and wing-nuts so that it may be detached whenever it is not needed. The depth of the "U" should be such, of course, that the shoe can easily be inserted and drawn back. If only one is fitted, it should be on the driver's side, but one can be fitted on each side if desired.

Oiling Auto Springs

By drilling a $\frac{1}{4}$ -in. hole through the floorboards on either side of his car at the point indicated in the drawing, an auto owner provided an easy means of oiling the rear springs. He found, however, that



dirt soon clogged the holes, causing the oil to seep along the underside of the floor and over the outside of the apron, which accumulated dust and presented a dirty appearance. This trouble he remedied by inserting a short length of brass tubing, flared out at the top, in

each hole. The tube extended about $\frac{1}{2}$ in. below the running-board shield and was bent to come directly above the spring shackles. Short nails were used to plug the holes between oilings.—R. C. Tarr, Gloucester, Mass.

Drain Box for Overshoes

When not in use, rubbers and overshoes can be kept in a box having a grating half-way down and a water-tight tray in the bottom. The rubbers are placed in the box, and the water, mud or snow drains off into the tray. The tray can be taken out and emptied whenever necessary. The grating is best made of galvanized material to prevent rusting. The box should be large enough to hold one pair of rubbers for each person in the building and, perhaps, a few extra pairs belonging to visitors.—E. T. Gunderson, Jr., Humboldt, Iowa.

Fencing the Haystack

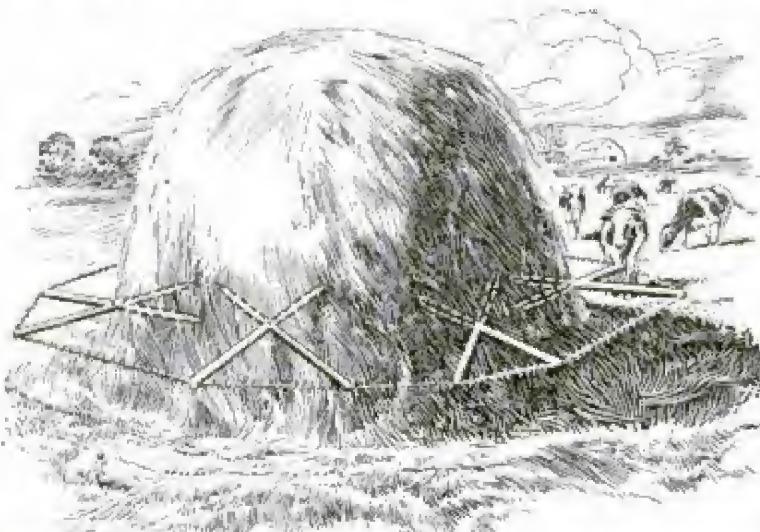
Stacks of hay and straw are frequently left in the fields during the rush of the season's work to remain until the farmer can take time for their removal to the barns or feed lot. As the live stock is usually pastured in these fields, it is necessary to protect the stacks by means of improvised fences. To accomplish this in the quickest manner possible and also eliminate the troublesome task of driving posts around the stack, a Wisconsin farmer has employed the novel method shown in the drawing. A number of sharpened stakes, 10 ft. long, are connected in pairs by bolting them together at the center as illustrated. When the stack is completed, these scissor-shaped braces are opened to an angle of about 25° and the sharp ends



Using Rubber Floor Mat as Water Carrier for Filling Radiator

Emergency Filler for Radiator

When one is in the country and discovers that the radiator has to be filled with water, but is handicapped by not having a pail or similar receptacle, the rubber floor mat will be found quite serviceable. By folding it, as shown in the detail, and holding the edges together firmly water can easily be carried in it and poured through the radiator opening.—Joseph A. Moffitt, Phoenix, Ariz.



Scissor-Shaped Braces Supporting a Barbed-Wire Fence around the Haystack

inserted horizontally into the stack at 10-ft. intervals and about 3 ft. above the ground. By stapling a strand or two of barbed wire to the projecting ends of the stakes, the fence is completed and prevents molestation by the live stock.

Raising Flagpoles

When raising a long flagpole or radio mast, a stepladder or other short ladder can be used as a prop. The base of the pole is placed over a hole dug for it as usual, and the other end of the pole is lifted. When the men who do the lifting have raised the pole as high as they can reach, the ladder is placed under it, allowing the lifters to move on and take a new hold where the pole is not so high. The ladder serves the same purpose as the props with forked ends used by linemen when erecting telephone poles, but these are not available to most people. A stepladder is better than an ordinary ladder for such heavy loads as its top step is stronger than the top rung of the other type.

¶Bread crumbs rubbed over a drawing remove the dirt but not the pencil lines.



Shallow Pan on Running Board of Auto Carries Ice without the Need of Tying It

Carrying Ice in Auto

An autoist who lived some distance from the route of the ice man found it necessary to get his own supply of ice. Not wishing to put it inside of the car, he made a shallow pan of galvanized iron, about 12 in. wide, 24 in. long and $\frac{1}{2}$ in. deep. The corners were soldered to prevent the pan from leaking. In use, it is attached to the running board of the car with two small C-clamps, obtainable at any hardware store. To hold the cake of ice in the pan securely and prevent it from sliding off while traveling or hitting the side of the car, a few roofing nails such as are used to fasten asphalt shingles were pounded through small pieces of galvanized iron and then soldered to the bottom of the pan so that the points projected upward.—R. C. Tarr, Gloucester, Mass.

Removing Insulation from Wires on Grinding Wheel

A grinding wheel can be used to remove the insulation from cotton-covered magnet wire by simply pulling it lightly across the face of the wheel. This cuts through the insulation on one side and

the rest falls off. If the wheel is run slowly little damage will be done to the copper wire and no harm to the wheel. Most kinds of wire can be bared by this method, but there are some that will gum and fill the wheel, for instance, rubber-covered wire. The wire should be held in both hands if possible and drawn straight across the face of the wheel.—E. T. Gunderson, Humboldt, Iowa.

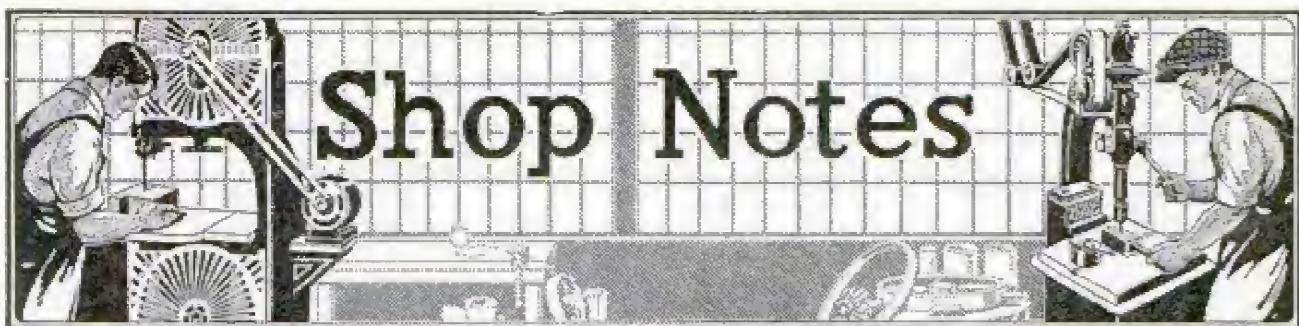
Easy Way of Pitting Cherries

One day, when it was necessary to can cherries immediately owing to other duties, and a cherry pitter was not available, I wondered how I was to pit them. I did not wish to crush them by pressing out the pits with the fingers, so I looked around the kitchen and found a wire from an ice-cream box. With this I pitted the cherries with the greatest ease and in a very short time without crushing them.—Miss C. Roskoten, Chicago, Ill.

Preventing Food from Burning

Practically all cooks, at times, place a plate in the bottom of a cooking pot to prevent puddings or other food from burning. Very often the hot fire drives the water from under the plate, which then becomes too hot and the food is at least scorched. To prevent this trouble, take a tin pie plate, put it over a piece of wood and with a nail and hammer punch a number of holes in the plate, from the inside. This leaves all the roughness of the punched holes on the underside, which is placed on the bottom of the pan. There will be no danger of scorching or burning

when this plate is used, because it is impossible to force all the water out on account of the numerous holes. There are factory-made articles used for this purpose, but a tin plate with punched holes as described is just as good.—James E. Noble, Toronto, Can.



All Shop Notes published in 1925, in book form—Fifty Cents—from our Book Department

Sharpening Your Own Saws

By EDWIN M. LOVE,

73 W. Valencia,
Arcadia, Calif.

THE teeth of a saw are miniature chisels, designed either with square points to cut parallel to the grain of the wood, as in a ripsaw, or with beveled teeth to shear across the fibers, as in a crosscut saw. The large teeth of a coarse saw, receiving greater individual pressure, bite deeper than the smaller points of a fine saw, generally cutting faster and, incidentally, rougher. However, a coarse saw

cut it, and the more play given the blade. Fatigue and play both make for inaccuracy, to say nothing of lessening production. Do not blame the saw for pinching before knowing whether or not the binding is due to sagging of the board being cut, or closing of the kerf because of internal strains in the material. Rub the blade often with an oil pad, and in ripping, wedge open the kerf behind the saw.



is used for rough work not so much for its greater speed as for the ease with which it can be sharpened. Many carpenters, and most amateurs, put too much set in their saw teeth. The wider the saw kerf, the more power required to

Some authorities advise the amateur to practice saw filing on an old saw, presumably one that has already been practiced on and cannot be made any worse. This is poor advice for the man who really

is offset. Do not make the mistake of bending out the beveled side, for then the saw will not cut at all. Hold the set always at the same angle, so as to give equal deflection to the teeth. This is

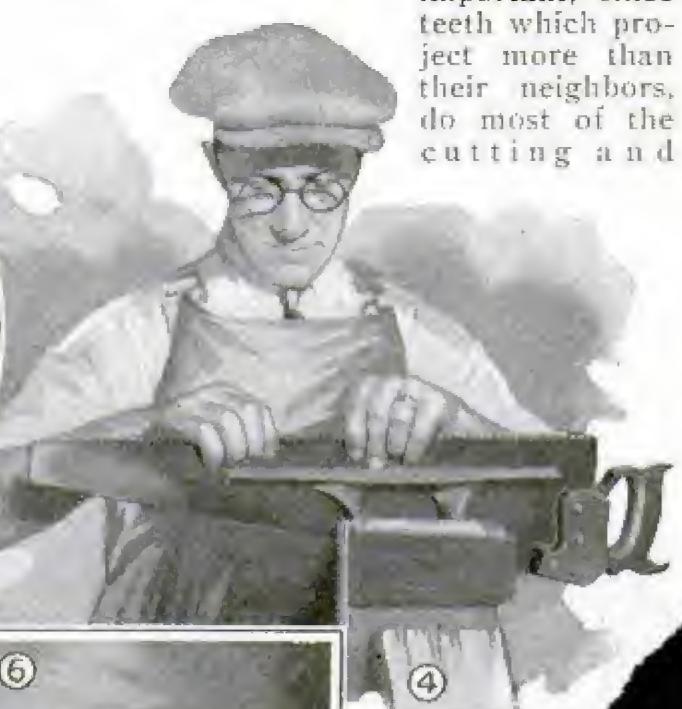
important, since teeth which project more than their neighbors, do most of the cutting and



wants to get skill in filing a saw. It taxes the ability of an expert to straighten up a bungled saw. The best practice is on a saw fresh from the hardware store, since it has teeth of even length, pitch and spacing. A new saw is never quite pointed up, but requires a light going over. At any rate, start on a saw that has been well filed, and reasonable progress can be made.

Sight along the teeth (Fig. 1) to see if they are fairly regular in length. They should appear as a straight, or slightly crowned line of "V's." Clamp the saw in a vise, and, using either a regular saw jointer (Fig. 3), or a mill file held flat (Fig. 4), take one or two light cuts full length of the blade. Sight the points again, and if there are any kinks or local curves, joint down the high points. The rule is to file lightly and sight often. When the points are reduced to a smooth line, examine carefully to see that all teeth have been touched. Each should show a tiny triangle of bright metal at the tip.

A saw does not need setting every time it is filed. If it is taper-ground, it will run in dry woods with almost no set. Adjust the anvil of a saw set (Fig. 2), rest the stops on the teeth, and grip each tooth just enough to bend it without crushing (Fig. 5). Only the upper half of the tooth



scratch the w
besides making
saw run out of t

For general filing,
the slim taper file
is good, though for
fine saws the extra-

slim taper is still better. A small file makes a smoother cut than a large one, and having sharper corners, gives a little more depth to the tooth and more sawdust clearance. Six-inch files are the shortest useful length, and they must be wide enough to project considerably above the points of the teeth. Drive the file tang solidly into a handle, to prevent turning, for a correct pitch cannot be maintained throughout the job if the file can twist.

To file a crosscut saw, clamp it solidly with the jaws about $\frac{1}{2}$ in. below the teeth, at the tip of the blade. With the file pointing toward the toe at an angle of about 45° and upward about 20° (Fig. 6), make a light stroke with the pressure against the forward or cutting edge of the first far tooth, using the back of the near tooth as a guide, and cutting the latter as little as possible. A light stroke is essential with a new file, for a heavy cut may chip the corner, spoiling it for further use. Never use a dull file, since it not only cuts slowly, but irregularly as well. A dull corner means a shallow gullet and chattering of the file on the rounded bot-

tom, with almost certain misshaping of the teeth. A good file may sharpen two or three saws; but these tools vary so much in hardness and toughness that it is not unusual to wear out one or more files on one saw.

The teeth and the spaces between them are 60° angles if filed straight across. Filing at an angle, however, makes them less acute. The natural result is that if the filing angle with the length is increased, some cutting on the back of the near tooth is inevitable, while if the angle is decreased, a certain play results that makes variation of pitch from tooth to tooth more likely. If regularity of this angle is kept, the pitch will therefore be more certain.

Up to a certain point, the more nearly the front of the tooth approaches the vertical, the faster the saw cuts, and generally, the rougher. The filer must make a choice between speed and quality. On fine saws the cutting edge of a tooth may be safely pitched at 25° or even 20° with the vertical, while with coarse saws the pitch may be still steeper.

If the saw is not very dull, one or two strokes to each tooth may be enough. File until the bright blunted triangle on the point all but disappears, and then go to

the next tooth on that side. When for any purpose the file is removed from the work, keep the grip on the handle unrelaxed, and the correct pitch angle can be more easily duplicated on the next tooth. To repeat, this constancy of filing angle is most important.

Having filed one side, reverse the saw and do the teeth on the other side (Fig. 7). The file still points to the toe of the saw, but the position of the body and arms is quite different from the first. Take care to use the same angle as for the other side, or the teeth will be of different size. File on the cutting edge of the tooth until the bright tip disappears entirely, since there is no danger of cuts being taken from the back. Stop the instant a point is obtained.

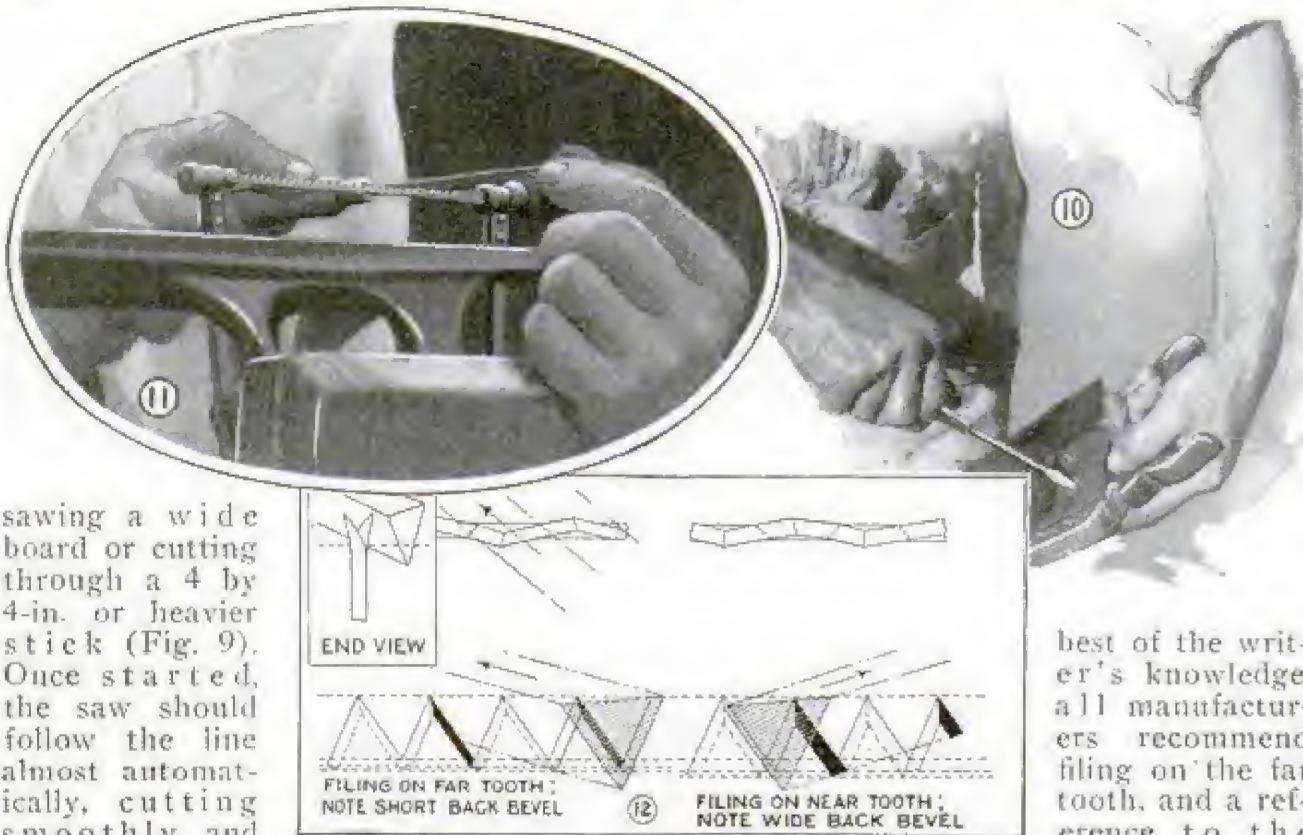
Having finished the saw, examine it carefully for underfiled teeth. It is surprising how many dull teeth may be found after filing is supposedly completed. Carefully touch these up.

Most teeth now have clinging to the cutting edges burrs which should be removed by laying the saw flat on a fine oilstone (Fig. 8) and drawing it across, once for each side, or reversing the process by laying the saw on a flat surface and



moving the stone over it. Sight down the teeth, and if the filing has been well done, the tips will show a smooth trough, in which a needle can slide full length without falling off. Give a further test by

three years, and himself for several years. A change to the above-described method, however, seemed to bring slightly better results, although it must be admitted the improvement may be imaginary. To the



sawing a wide board or cutting through a 4 by 4-in. or heavier stick (Fig. 9). Once started, the saw should follow the line almost automatically, cutting smoothly and quickly. If the teeth on one side are long, the saw will be deflected toward that side because of the faster removal of waste there. For the same reason, if the teeth on one side are duller than on the other, the saw will "run" toward the sharp side. It is for this reason that it is so important to get absolute uniformity in the teeth.

A ripsaw is jointed and set in the same way as a crosscut, but all the filing is done from one side, taking all teeth in their turn. Use a large enough file, hold it level, and file nearly square across, making the fronts of the teeth vertical, or nearly so. Most authorities advise filing square across; but it will be found an advantage to give a slight bevel by pointing the file a little left or right, as the case may be. This does not injure the ripping qualities, and greatly facilitates cutting through knots.

Because the reader is sure to find a carpenter who files his saws against the cutting edge, rather than with it, a comment about this style of filing is in order. It has one very strong argument in its favor, namely, that no feather edge is turned up. This reason was sufficient to induce the writer's grandfather to use it during his lifetime, his father until within the last

best of the writer's knowledge, all manufacturers recommend filing on the far tooth, and a reference to the diagram (Fig.

12) illustrates certain differences in the shape of the tooth obtained, which may or may not prove the superiority of far-tooth filing to the other.

Whichever method is used, the filer generally has the point of the file higher than the tang. This establishes a fundamental difference in the resulting teeth. With the far tooth, the gullet slopes down away from the cutting edge, while, in the other case, it slopes up from the cutting edge. With any given number of points per inch, therefore, a longer cutting edge is obtained when filing against the tooth. It might seem that this is an advantage, giving greater sawdust space and a longer shearing cut per tooth, but it must be remembered that, because of setting, the point does nearly all of the cutting, so that the total length is not so important. It will be noticed, moreover, that with the accepted method of filing on the far tooth, the back of the tooth has considerably less bevel than in the other case, the point itself is less acute in the thickness, and the tooth is correspondingly stronger, less likely to break when struck against a nail, and more resistant to wear.

Avoid freak tooth forms. Once in a while a carpenter is found who pitches his

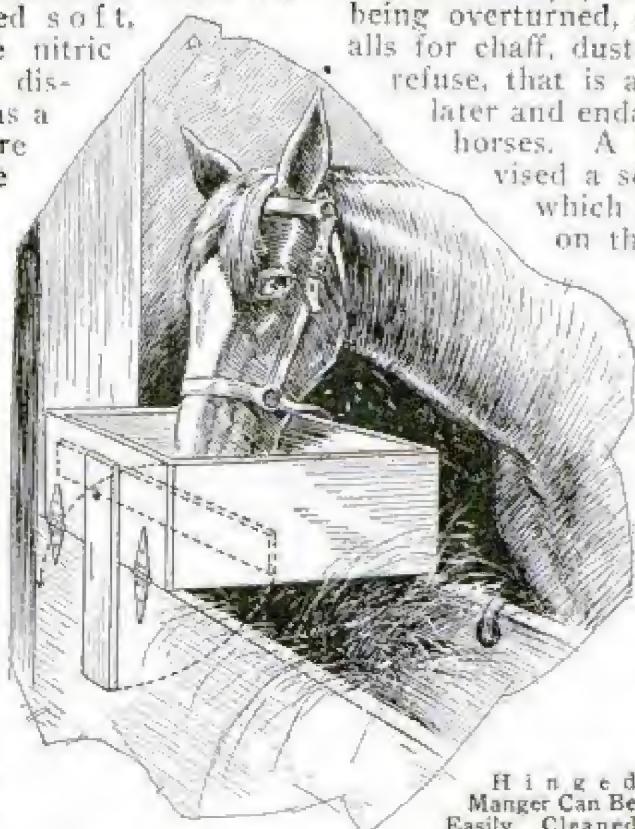
cutoff-saw teeth like ripsaw teeth, but gives them the customary bevel. There is nothing to be gained by this. If a great deal of angular cutting is to be done, such as mitering sheathing, or cutting wall braces and floor-joist bridging, this style of tooth is excellent, and it is worth while to keep on hand for such work a saw filed so, but it is a poor tool for general work.

Whenever possible, avoid setting a backsaw, although a small amount of set is almost necessary for a miter-box saw. Do not pitch the tooth more than 25° with the vertical. Well sharpened, the saw should cut so smoothly that, to use a block plane afterward, would roughen the cut.

Compass saws and their variations may be filed as a compromise between rip and cut-off teeth, since they rip as much as crosscut.

Few people know that a coping saw can be filed. As a matter of fact, even a new blade is dull and can be improved by filing. Put it in a coping-saw frame and clamp it in a vise. Then file almost square across, with the file held level, taking each tooth in turn and giving a little bevel according to the set (Fig. 11).

By all means preserve the polish of a saw. Rusty spots mean binding, and the attendant evils of buckling and kinking. If the blade has been exposed to rain, rub it dry immediately, and oil it. Rain water, though considered soft, really contains some nitric and carbonic acid, discouragingly efficient as a rust producer. Beware of it. When tools are near the seashore, take special precautions to prevent the salt air from corroding them. Keep saws out of the vicinity of dynamos and other electrical machinery, for once they are magnetized, the filings cling to the teeth, making sharpening difficult. Tighten the handle screws occasionally (Fig. 10), since true cutting cannot be done with a slack blade, and once in a while also give the handle a polish with linseed oil on a clean rag, finishing it with a dry one.



Hinged
Manger Can Be
Easily Cleaned

Lighting Manholes

Trouble-shooting trucks of a western gas and electric company are provided with a reel, holding a 30-ft. extension cord



Special Six-Volt Lamp on Extension Cord for Lighting Manholes

and a special lamp, which is operated on a 6-volt storage battery. This equipment is used for lighting the interior of manholes that are not fitted for plugging in with the city-lighting system.—Charles W. Geiger, San Francisco, Calif.

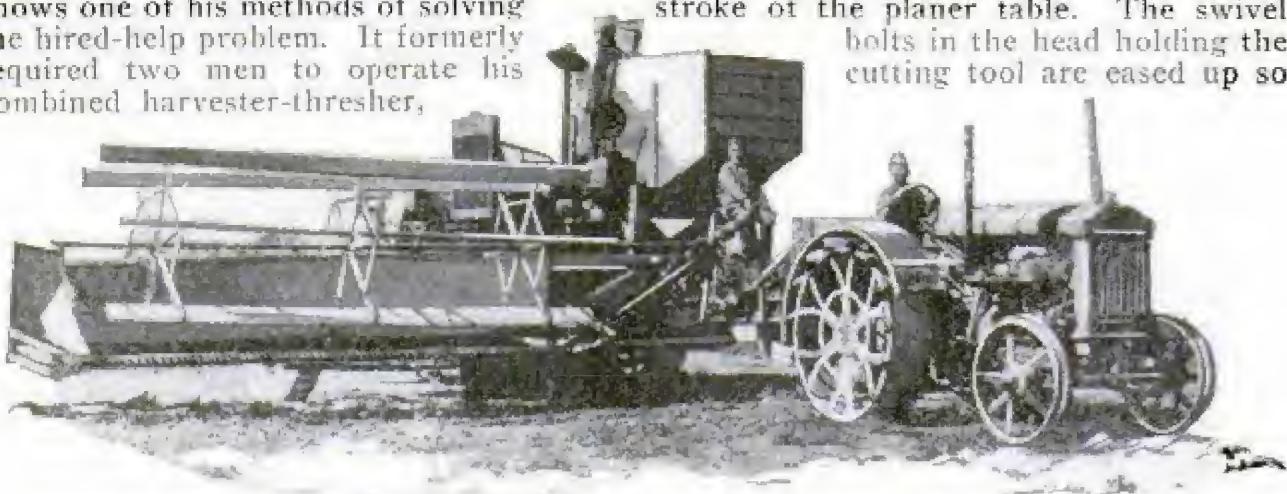
Easily Cleaned Feed Box

Feed boxes in horse mangers are usually permanently fastened to prevent their being overturned, and so become catchalls for chaff, dust, corncobs and similar refuse, that is apt to mold sooner or later and endanger the health of the horses. A Wisconsin farmer devised a self-locking hinged box

which may be dropped down on the side of the manger, allowing all trash to be thrown out of the feed box. When the box is put back in place again, the latch drops down without any attention and locks the box. The latch is a 1 by 4-in. board, about 2 ft. long, bolted to the center of the door and suspended like a pendulum against the back of the manger, as shown in the drawing. When necessary to turn it over for cleaning, the latch is raised to a horizontal position, and the box is swung over.

Improving the Combined Harvester and Thresher

In western Kansas there is a farmer who does not spend all of his hours in doing manual labor, but still farms broad fields and hires little help. The photo shows one of his methods of solving the hired-help problem. It formerly required two men to operate his combined harvester-thresher,



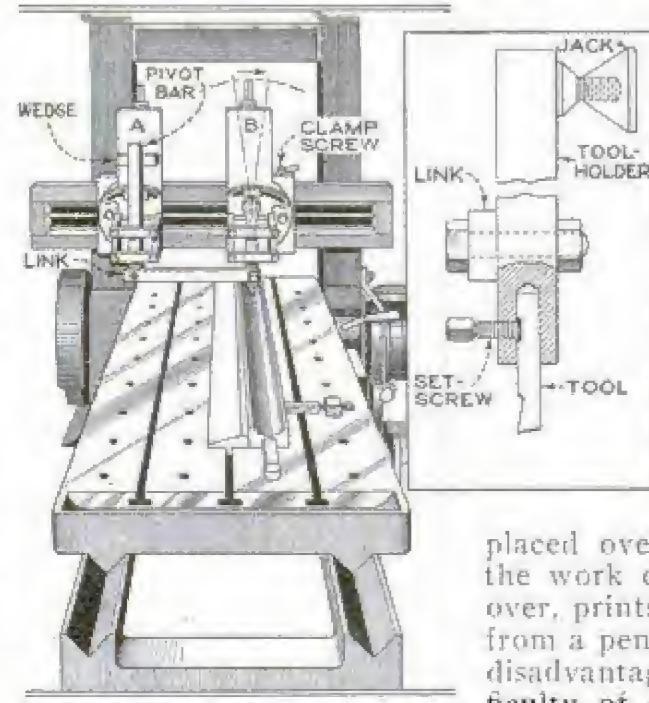
Combined Harvester-Thresher Changed So That All Adjusting Levers Are Located on the Rear of the Tractor, Which Permits One Man to Operate Both the Tractor and the Combination Machine

one to drive the tractor and the other to operate the adjusting levers. Removing the front trucks from the combination and mounting the adjusting levers on the rear of the tractor permitted one man to take care of both. Some of the levers had to be changed to make them set forward instead of backward. This gave a short-coupled outfit, much lighter than before the change. With it a worker can cut 160 acres of wheat yielding 6,500 bu., in $5\frac{1}{2}$ days, and with one man to haul the threshed grain from the field, he placed the crop in the bin at about $\frac{3}{4}$ cent per bushel.

Radial Cutting on Planer

Radial cuts on the planer are the exception rather than the rule for a machine primarily designed to form plane surfaces. However, by means of a simple arrangement curved work is easily produced. The bars A and B are the only extra parts required for the rig, and a hole is drilled in one end of each

for the connecting link shown. The bar B is drilled and provided with a setscrew for holding the cutting tool, while the other bar is clamped in the right-hand head and wedged to hold it solidly. A machinists' jack is placed back of the bar B to prevent it from rising on the return stroke of the planer table. The swivel bolts in the head holding the cutting tool are eased up so



Radial Cuts on Planer Are Easily Made by This Set-Up

that the cutter can be pulled around in an arc when fed over by the feed box. The tool-holding head is clamped tightly to the cross rail. Set the tool bar to cut the required radius and start the cut, feeding the tool as desired.—R. W. Laing, Kirkhall, Canada.

Hints for the Draftsman

Rub magnesia carbonate on vellum before beginning a drawing. This will permit complete erasure of all pencil lines and the drawing will remain much cleaner. It can be purchased in the form of a cake. Rub the cake over the vellum, then work it in thoroughly with a cloth. It seems to fill up the pores and harden and improve the surface in every way. The transparency of vellum is a great advantage for it can be placed over other drawings and the work can be traced. Moreover, prints can be made directly from a pencil drawing on it. The disadvantages are the great difficulty of erasing and the tendency to become soiled, and the

planned over other drawings and the work can be traced. Moreover, prints can be made directly from a pencil drawing on it. The disadvantages are the great difficulty of erasing and the tendency to become soiled, and the

kink mentioned above eliminates both. To prevent the T-square from soiling the drawing as it slides up and down, put a string over the drawing and fasten the two ends together under the board with a rubber band and a hook made from a paper clip. Two or more strings should be used, on which the T-square slides. The rubber bands keep the strings tight and can be shifted to avoid the triangles.

To prevent your pencils from rolling, cut a piece of eraser, about $\frac{1}{2}$ in. square and $\frac{1}{4}$ in. thick; make a hole in the middle and slip it over the end of the pencil. The hole can be made by using the tin eraser holder on the end of an ordinary pencil as a drill.

Adjustable Jack for Repair Work

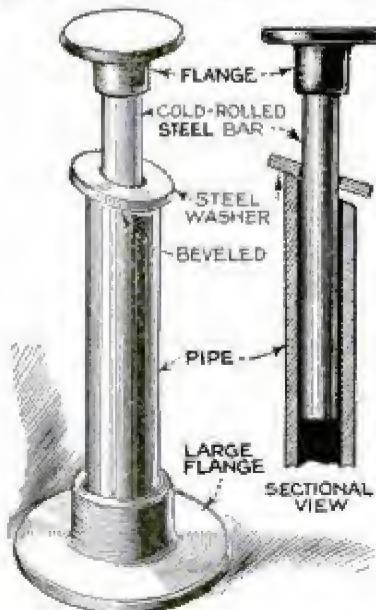
Screw jacks, ratchet jacks and hydraulic jacks are normally used in repair work on heavy machinery, to support parts when disconnected. A simple idea for a jack is shown in the drawing. The base is a pipe flange of large diameter. The body consists of a pipe screwed into the flange, with the upper end beveled. The jack bar is made of cold-rolled steel or any

smooth iron bar. The upper end of the bar is fitted with a flange to provide a wide bearing area. The latch is simply a large heavy washer, fitting freely on the bar with several hundredths of an inch clearance. The washer in the canted position

grips and locks the bar against downward movement.

Use of Gypsum Weakens Cement

Where gypsum and cement are mixed together and subjected to moisture the gypsum deteriorates or "rots," and the cement will be weakened considerably. Gypsum plaster on a cement wall, which becomes damp or wet, will also rot within a short time. Therefore, gypsum should never be used in cement.—L. E. Gulker, Rainier, Oreg.



Wall-Paper Display Rack Made of Window-Shade Rollers

Display Rack for Wall Paper

A good display rack for wall paper can be made to hold a number of rolls by using common window-shade rollers, cut to the desired length and fixed in a frame with the regular brackets, as shown, so that the pattern will be uppermost when the paper is pulled out.—L. E. Brundage, Norwood, Colo.

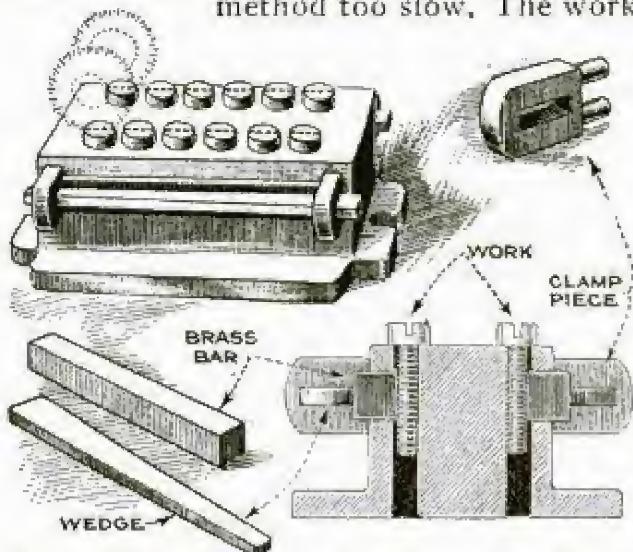
Hanging Windows

Hanging windows so that they can be quickly opened and closed, can be done as shown in the drawing without the use of boxing. Light iron channels, placed along each side of the opening, provide grooves in which pins fitted into the ends of the lower sash slide. The upper sash is hinged to the top of the window casing and the bottom sash is hinged to the upper one in the manner indicated. Upward movement of the lower sash raises the upper one, and when completely opened, both sash will extend at nearly right angles to the opening. Counterbalancing should be provided or the window operated by rope and pulley.—A. C. Cole, Chicago, Ill.



Gang Slotting Fillister-Head Screws

We had a large number of fillister-head screws to slot and had been putting them one by one in a vise to do it, but found this method too slow. The work

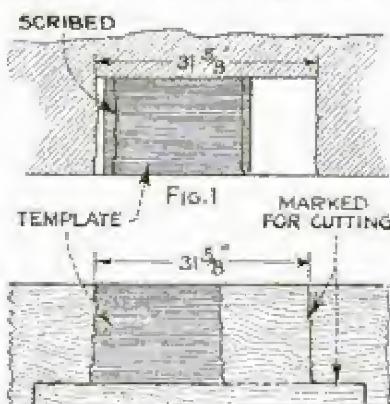


Fixture Which Makes It Possible to Slot Twelve Fillister-Head Screws at Once

was accomplished much more quickly in a milling machine, the table of which was operated by means of a hand lever. We made a cast-iron block, drilled 12 holes in it, and slotted a space for a brass bar on either side to hold the screws securely when tightened by means of a wedge, which was slipped into slotted endpieces as shown. With this fixture we were able to slot twelve screws just as quickly as one could be slotted in the vise. The holes for the screws were made slightly oversize to provide clearance.—J. H. Moore, Montreal, Canada.

Difficult Fitting Made Easy

One of the most difficult jobs in carpentry is scribing both ends of a board to fit it between two irregular surfaces. The upper detail of the illustration shows a



placed at the right of the opening and scribed, which is indicated by the irregu-

lar line at the right. The template is then shifted to the left position and scribed, which is indicated by the irregular line shown to the left. The distance of the back of the niche must be transferred to the uncut stool, giving allowance at each end for the lugs. Place the template in such a position that the lines can be marked accurately. If the back is also irregular, a second template is made, on which the back line is scribed, and then transferred to the uncut stool. In such a case the back must be marked first.

Starting the Knurling Tool

From personal observation I have learned that many mechanics have great difficulty in getting a knurling tool properly started. The common straight knurled surface is, of course, very easily made, as the knurling tool has only one roller, but the trouble is when the novice attempts to use the double knurling tool, which has one roller milled with a right-hand spiral and the other with a left-hand spiral. The two rollers are generally set one above the other, and when properly applied to a job, make a knurled surface with a diamond pattern. The rollers must be in exact relation to each other when they revolve against the work, otherwise a surface is made that much resembles the teeth design of a crosscut file. In order to get the rollers properly timed with each other, I found it best not to apply the full width of the roller to the work in the beginning. After the knurling tool has been properly set at right angles with the job, it should be fed against the end so that only one half of the roller surface comes in contact with the work, as is shown in Fig. 1. By applying good pressure using the cross-feed screw, the rollers will time themselves properly and a true diamond-shape knurl will be formed by letting the tool feed along the work.—Chas. Homewood, Ontario, Calif.

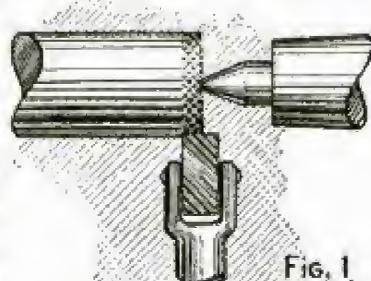


Fig. 1

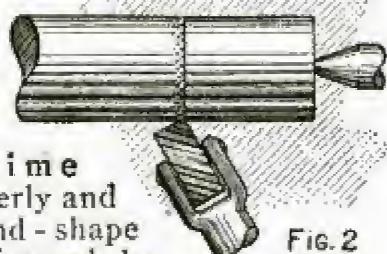
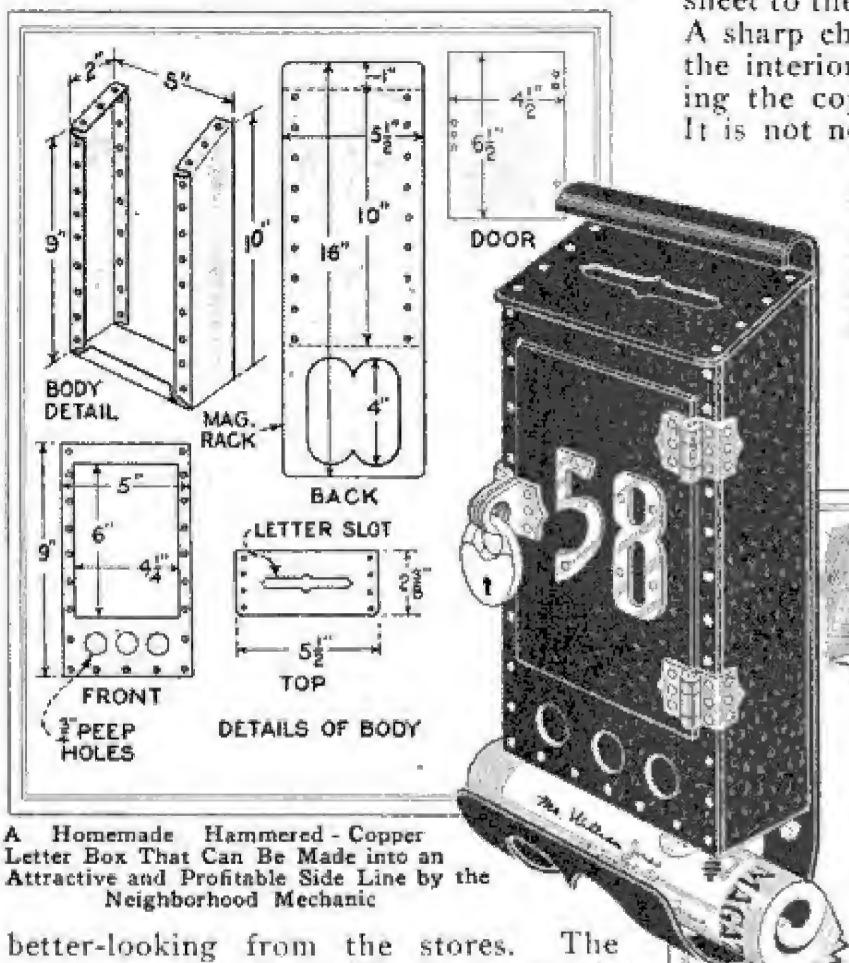


Fig. 2

Don't drive a key into place unless you have some means of getting it out again.

A Hammered-Copper Letter Box

The common purchased letter box is not a very attractive thing, yet, without paying a considerable sum, the home owner is usually unable to obtain anything

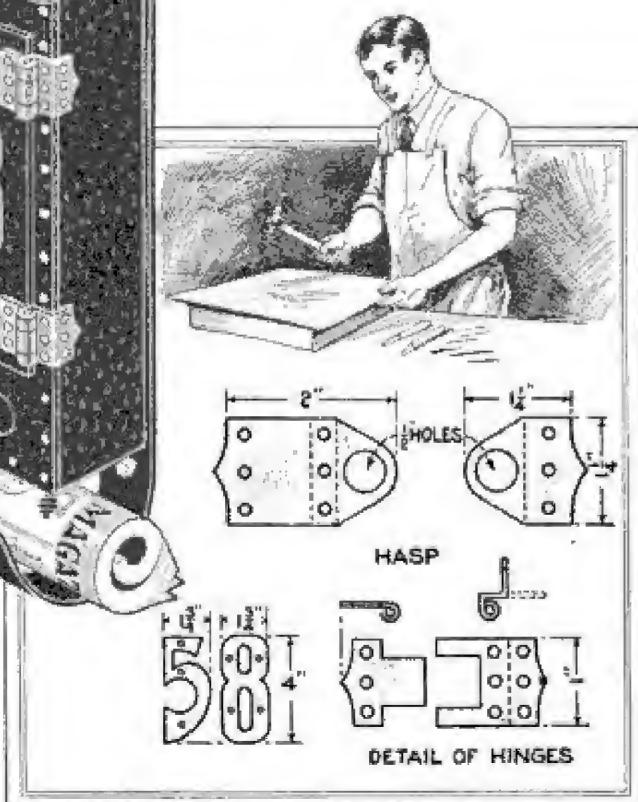


A Homemade Hammered-Copper Letter Box That Can Be Made into an Attractive and Profitable Side Line by the Neighborhood Mechanic

better-looking from the stores. The usual way out of the difficulty is to paint the box the same color as the trim of the house, and thus make it as inconspicuous as possible, but even this does not entirely satisfy the owner. The letter box shown in the accompanying illustration is not only pleasing in design but simple enough for the handy man to make himself. If a few of the boxes are made up as samples, a neighborhood mechanic should have little difficulty in disposing of them to the owners in his vicinity, and there is good opportunity to build up a side line that should prove remunerative.

The house number may be made a part of the box in the manner suggested in the drawing. If the number is one of four figures, these, of course, must be made smaller, and the number arranged on the box front diagonally. The rivets used in the assembly of the box may be omitted, if desired, and the entire box soldered, but the rivet heads add greatly to the "spirit" and attractiveness of the design, and it is recommended that the riveted construction be used. Sheet copper, $\frac{1}{16}$ in. thick, is the material used.

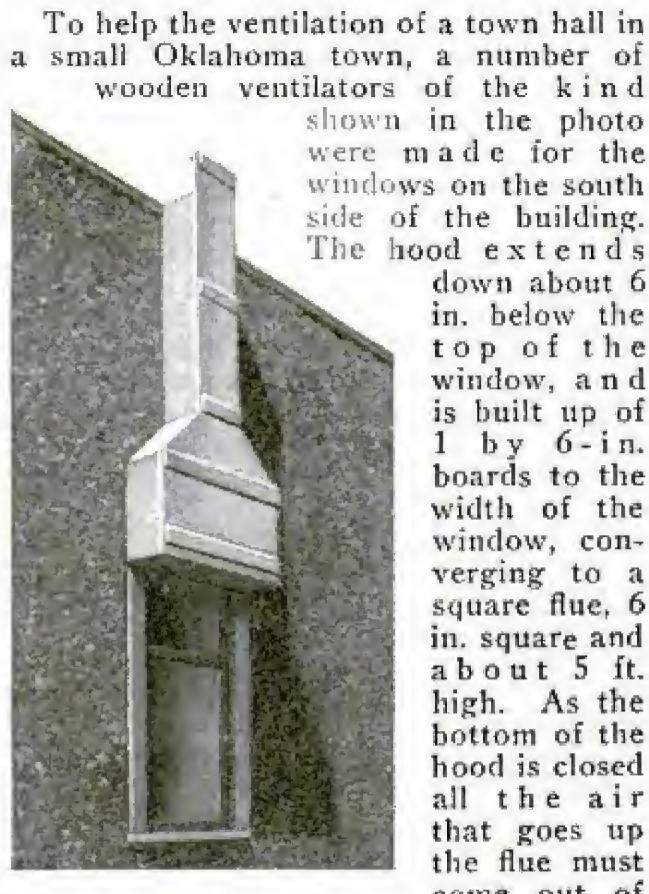
This can often be obtained from an old tank, since the surface of the copper plates is to be hammered in any event, and small dents in the sheet from which it is made will not be any drawback. The amateur will have little difficulty in cutting the soft sheet to the outlines given with the shears. A sharp chisel should be used to cut out the interior parts of the design, supporting the copper sheets on a metal block. It is not necessary that the edges be exactly even, although they should not be left ragged. After the sheets are cut, place them on a piece of hardwood, and go all over the surface lightly with the ball-peen end



of a machinists' hammer, in order to make the indentations on the surface that give the box its antique look. Do not try to have all the hammer marks exactly alike in depth, but do not vary them too much. The hinges and hasp should be of copper rather heavier than that of the body, and copper rod, $\frac{1}{8}$ in. in diameter, used for the hinge pins. Fasten the box to the house with large copper ship nails, if these can readily be obtained. If not, use round-head brass screws, and slightly mar the heads, after driving the screws home, with the hammer.—G. A. Luers, Washington, District of Columbia.

Leave the oven of your gas stove slightly open for a few minutes after the burners are lighted, to prevent rust.

Wooden Flues Help Ventilation



the hall, and when the upper sash is opened the warm air is quickly drawn out. It is claimed that air was drawn out at least three times as fast with these flues when installed as when the windows simply were opened at the top.—Dale R. Van Horn, Walton, Nebr.

Baling Scrap Sheet Metal

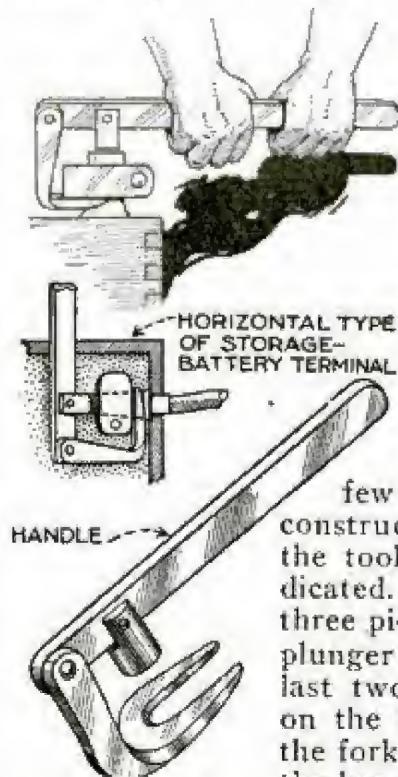
What do you do with your scrap sheet steel? We used to put it in a pile or in a large box and then haul it out back of the plant. But scrap sheet metal handled in this way was of no value to us. We even had to pay to have the pile removed. This work was a miserable job, taking days and resulting in many cuts on the hands. So we built a baler to remedy the trouble. The frame was made of $\frac{1}{8}$ by 1 by 1-in. angle iron, inclosed with No. 20-gauge sheet steel. To provide a convenient size of bale, both in weight and dimensions, we made the box 20 by 38 by 18 in. Two recesses along the side allow insertion of two baling wires, which are put in the baler before the scrap. The time saved in the process of baling easily offsets the time taken to cut long narrow strips into lengths that will enter the baler. Some man who is not busy all the time can be appointed to do the baling. We now have a clean floor space around our

shears and never have to worry about moving our scrap-steel pile. The dimensions of the baler, of course, can be altered to suit plant conditions and equipment.—W. E. Gunnerson, Milton, Wis.

Drive Fit on Pins

When a pin is to be secured in a chuck wrench, or a dowel is to be made a drive fit, many mechanics flatten it slightly with a hammer or make a series of prick-punch marks around it. This makes a poor job that usually does not last long. It is much better to lay the pin in a V-block and make from one to three cold-chisel marks around it parallel to the axis. The ridges thus made keep their holding power, no matter how deep the pin may be driven and also prevent it from turning. The best method of all is to knurl the pin, but often a lathe is not available, and the above method is then the next best.—John A. Blaker, West Auburn, Mass.

Removing Cable Lugs from Car Battery



With only a pair of pliers and a wrench it often takes 15 or 20 minutes to remove a storage battery from a car, but with the aid of the handy tool illustrated, it takes only a few seconds. The construction and use of the tool are clearly indicated. It consists of three pieces, a handle, a plunger and a fork, the last two being pivoted on the handle. In use the fork is placed under the lug of the cable and the plunger on the battery terminal. Pressure on the handle then pulls the lug off the terminal. This is a simple tool, and the time spent in making it will be repaid many times by the ease and rapidity with which it does the work.

¶ Draftsmen should remember that a little note of explanation in the corner of a drawing often helps the worker.

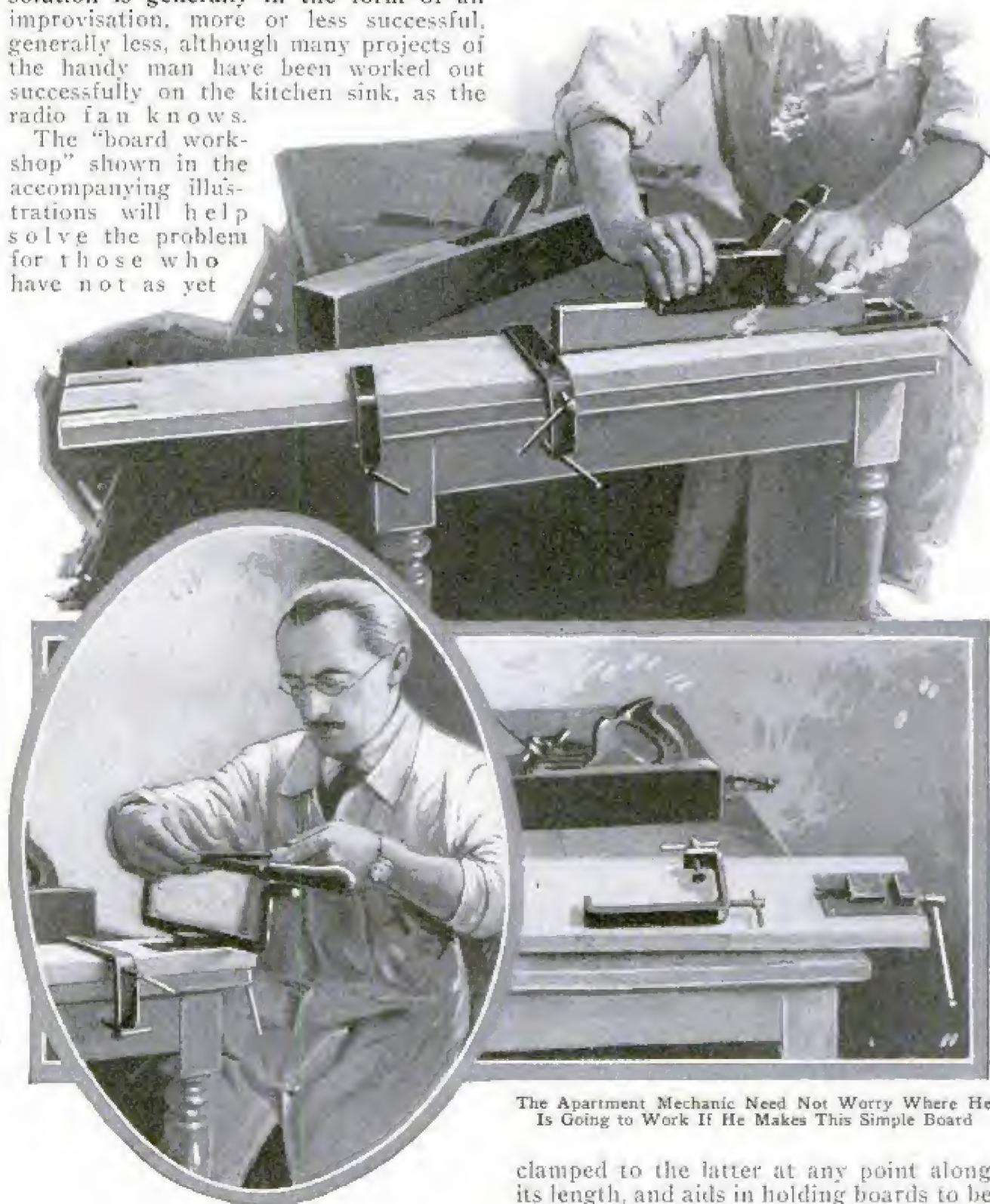
A Corner Workshop for Apartments

By A. C. LESCARBOURA

THE handy man who is bent on pursuing his hobby in the narrow confines of a small apartment must resort to no end of makeshifts. First of all, he must find space enough to do his work, and, in the modern birdcage kitchen, that may be no simple problem. His work completed, he must find storage space for his equipment, and that also gives the amateur mechanic furiously to think. The solution is generally in the form of an improvisation, more or less successful, generally less, although many projects of the handy man have been worked out successfully on the kitchen sink, as the radio fan knows.

The "board workshop" shown in the accompanying illustrations will help solve the problem for those who have not as yet

arrived at any satisfactory answer. The foundation of this is a plain board, about 2 by 8 in., although the size of the board can be suited to individual preference. This is held down to the kitchen table by means of two clamps, made from flat steel or iron, as shown in the detail drawing. One of the clamps serves only to hold the board to the table; the other, in addition to holding down the board, may be set and

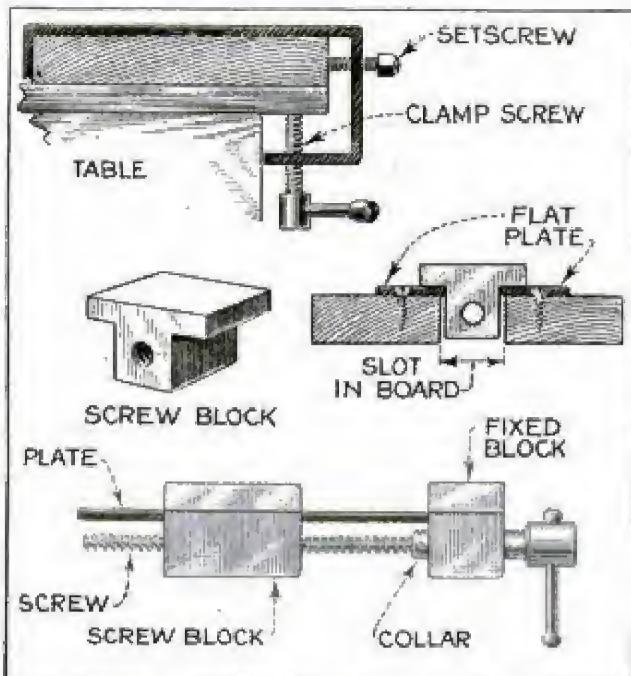


The Apartment Mechanic Need Not Worry Where He Is Going to Work If He Makes This Simple Board

clamped to the latter at any point along its length, and aids in holding boards to be

planed or otherwise worked, as shown in the upper photo of the larger illustration. The drawing shows the construction of this clamp clearly enough to make further description unnecessary.

While any kind of vise that the maker desires can be used at the end of the



Details of the Movable Clamp for the Board and the Easily Made Vise

board, the one shown is particularly suited to the job, as the rear jaw moves instead of the front one, and it thus becomes a work clamp when used in connection with the movable flat-steel clamp. Thus, when planing a length of wood, or gluing boards together, the vise is closed, the wood placed behind the rear jaw, and the movable clamp slid along the board to the other end of the work, whereupon it is tightened.

Now, by opening the jaws of the vise, the work will be held firmly. The vise is set in a slot cut in the end of the board, and the various parts are not at all hard to make. The jaws may be castings, but the home mechanic will probably find it easier to cut them out of machine steel using the same material for the plates on which the screw block runs. The screw may be one taken from a cheap vise, or one may be made in the local machine shop at small cost.

With this workshop, there is no danger of marring the kitchen table, and the owner can work to his heart's content. It will be found advisable to place small blocks under the points of the clamp screws, below the edge of the table. Quite a lot of good work can be done with this simple outfit.

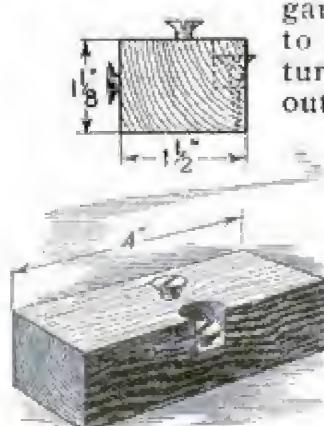
Repairing Ford Battery Carrier

Ford battery carriers often cause trouble due to loosening of the four rivets, which hold the wide band underneath. This allows the battery and band to swing from side to side with the motion of the car. In some cases the battery will drop so much that the clamps will no longer keep it in place. This will even occur when the fastening bolts are tight and the carrier is well bolted to the frame. A remedy is to remove the battery from the carrier and the carrier from the car, cut off the four rivets with a cold chisel on the outside of the carrier, and drive them out. Then holes are bored with a $\frac{1}{16}$ -in. drill for carriage bolts of this size, which are placed with the heads on the inside of the carrier. These holes should be countersunk or squared on the inside of the band to fit the squared part of the bolt. Use $\frac{1}{16}$ by $1\frac{1}{8}$ -in. bolts, such as those clamping the flat-iron bands about oval or round Ford gasoline tanks. These are somewhat too long, but are best suited for the purpose, as they have a shorter squared part and a flatter head than ordinary carriage bolts. Lock washers should be used under the nuts. The bolts can be tightened from under the car when necessary.—E. T. Gunderson, Jr., Humboldt, Iowa.

Homemade Hinge or Butt Gauge

An accurate and efficient hinge or butt gauge used for hanging doors can be made as follows: Take a block of hardwood, preferably maple and about 4 in. long, $1\frac{1}{2}$ in. wide and $1\frac{1}{8}$ in. thick. Into the face of the block drive a small screw, file the edge of the head so that it will cut well and set the screw to the distance that the hinge is to go back on the door. The

gauge can be adjusted to any depth by simply turning the screw in or out. Now, into the side of the block drive another screw, sharpening it in the same manner and turning the screw in so that the cutting edge is the same distance away from the block that you desire the hinges to let into the door and jamb. Now turn the block up on its edge. On one of the outside edges and about halfway of the length of the block drill a hole the same size as the

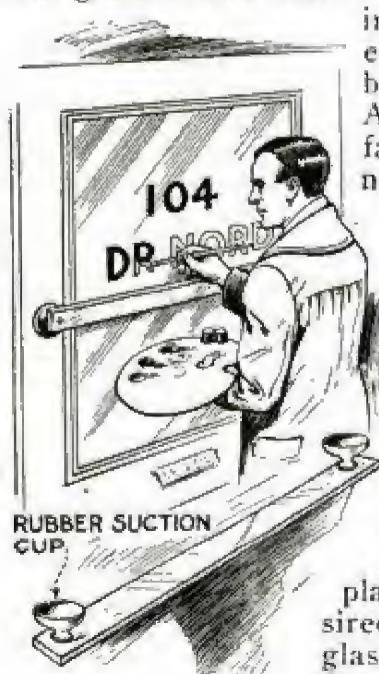


head of the screw you are going to use for a cutter, so that only about three-fourths of the hole is in the block. Turn the screw into the hole and you will see that you have a cutter made by the head of the screw sticking out past the face of the block. This gives you the gauge that marks the distance that the hinge is to be set into the door jamb from the door stop. You never use this gauge endways as you have to use the regular metal gauges, thus there is no wobble or variation. It is very light and can be easily carried in the pocket. It can be made by anyone in a few minutes and will last indefinitely, as there is nothing to rust except the screws, which can readily be replaced.—C. E. Gardner, Herndon, Va.

Drawing Guide for Window Letterer

A simple and useful device for a window letterer, which promotes accuracy and speed, is a guide rail supported by two rubber suction cups. It is used in place of the ordinary maul, or padded stick, which most letterers hold in the left hand, with one end against the glass and the forepart of the right arm against the stick. The guide shown is about 36 in. long, having

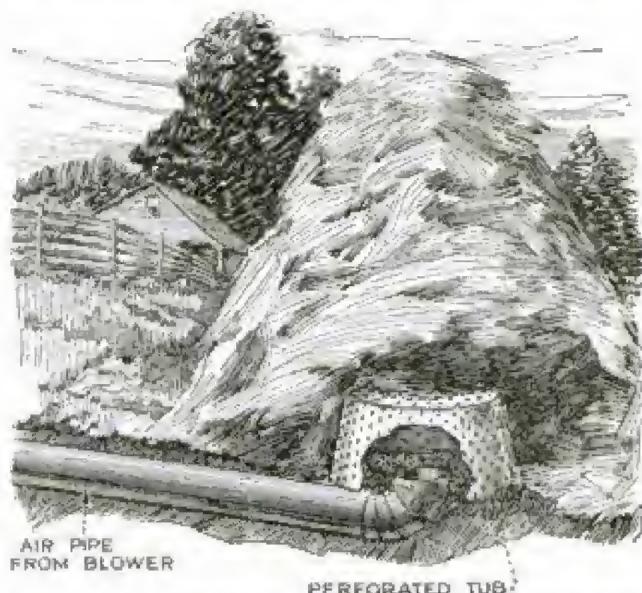
a straight edge so that it can be used as a ruler. At either end is fastened an ordinary rubber suction cup such as is used on electric massaging devices. It is provided with a threaded metal inset by which it can be fastened to the end of the stick. This guide can be placed in any desired position on glass or wooden surfaces and will provide a firm support for the hand.—Hoag & Ford, Los Angeles, Calif.



To keep the mother hen from scratching and wasting chick feed, cover a piece of 1 by 12 by 24-in. board with $\frac{1}{2}$ or 1-in. mesh poultry wire by tacking it to the edge; then nail a strip of lath to the edge to form a shallow box. This will stop the waste of expensive chick feeds.

Air Blower for Curing Hay Independent of Weather

There is always an element of uncertainty in depending on favorable weather conditions when the hay is to be cured.



Curing Newly Cut Grass Artificially Gives Good Quality and Uniformity to the Hay

The illustration shows a method of curing it by means of an air blower that is always dependable, and the quality of hay is generally much better and more uniform than if it is left to dry on the ground before stacking. A length of pipe is led from the fan or blower, just underneath the surface or on the ground, to the center of the spot where the stack is to be made. The end of the pipe is fitted with an elbow, the opening turning upward. An ordinary metal washtub is perforated with a number of $\frac{1}{2}$ to 1-in. holes through the sides and bottom and turned over the end of the air pipe as shown. The hay is piled in a medium-size stack over the tube and the blower started. By this means air will be driven through all the hay and a sweet, mellow roughage will result.—L. M. Jordan, Vredenburgh, Ala.

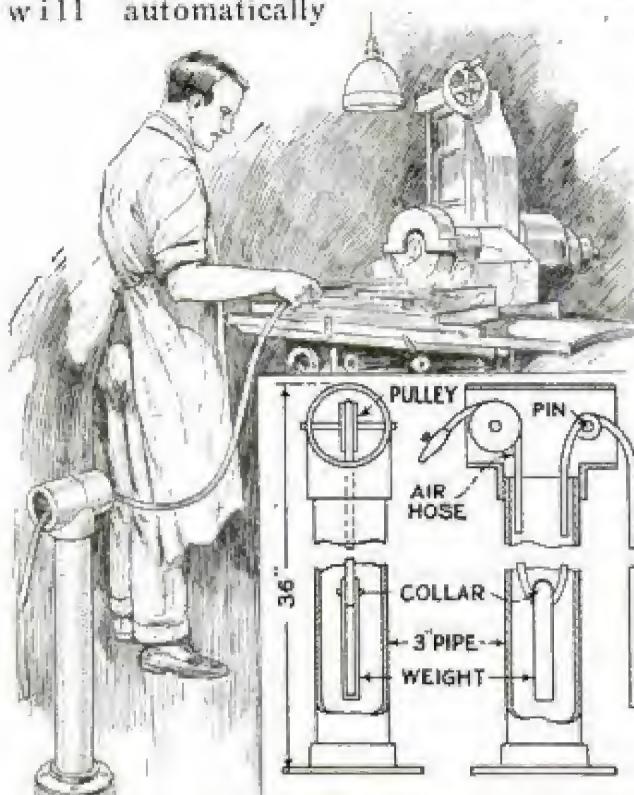
Safety Link in Tow Chain

When plowing with a tractor it is always advisable to use a weak link in the drawbar chain so that it will give when a large stone is struck. It can be made by using a piece of rod iron and bending it to the shape of an "S," as shown in the illustration.—W. R. Smith, Cloverdale, Can.



Disappearing Air Hose

Whenever an air-hose nozzle is used within a limited radius, a disappearing holder such as that shown in the drawing will automatically



Convenient Holder for Air Hose in Woodworking Plant Disappears When Not in Use

hold the nozzle and hose out of the way when not required. It is often quite dangerous to leave a hose lying around a machine, and, aside from this, it is a nuisance to have to continually move it away or hang it up. To make the holder, a length of 3-in. tube, a tee and floor plate are assembled in some convenient place, preferably against the wall or a post. Before assembly, the tee is drilled through on both sides. On one side a pin is driven in and the hose wrapped around it one turn. The other side has a loose pin, headed over at each end to keep it in place, and carrying a pulley made from a shaft collar with a washer on each side. A weight is made out of a piece of flat iron doubled over and drilled through at the open end for a pin carrying another shaft collar, which acts as a roller. The operation of the holder is obvious. When the hose is re-

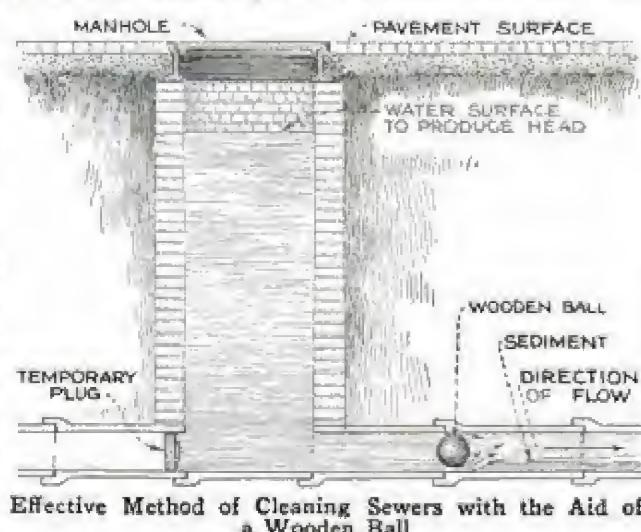
quired the nozzle is pulled out, causing the weight to rise. When the nozzle is released the exposed hose disappears inside of the tube leaving the nozzle only outside. This is made certain without injury to the parts by arranging that the weight strikes the floor just before the nozzle reaches the tee. Care should be taken not to use a weight that is unnecessarily heavy but one that counterbalances.—Harry Moore, Montreal, Can.

Polishing Radius of Screw-Machine Form Tools

To polish a radius in a form tool, get it free from scratches and keep the radius true has always been one of my most difficult jobs. I now do it to perfection by turning a piece of brass to the proper diameter and using it for a lap. After the radius has been cut in with a tool and filed fairly smooth, the tool is run slowly in the lathe, while the lap, driven rapidly in an electric drill chuck, is held in the groove to be polished. The lap should be fed generously with valve-grinding compound, grade D. Grade A is used for finishing. It will be necessary to use several laps as they wear down rapidly. As there are two rotary motions at the same time, a radius is generated to perfection, which is impossible by any other method.—John A. Blaker, West Auburn, Mass.

Cleaning Sewers

Sewers, which are not completely plugged can be cleaned as shown in the accompanying drawing. A wooden ball, slightly smaller in diameter than the inside of the pipe is placed in the sewer at the first manhole above the section to be cleaned. The manhole is filled with water and the pressure from this head of water pushes the ball downstream through the



Effective Method of Cleaning Sewers with the Aid of a Wooden Ball

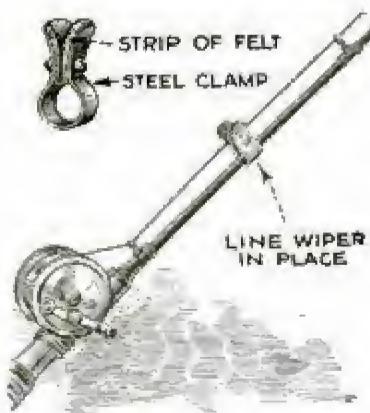
sewer, the small quantity of water which crowds between the edges of the ball and the sewer, at high velocity, washing the deposits downstream ahead of the ball. The section of sewer running upstream from the manhole should be plugged temporarily to reduce the amount of water needed.—Ivan E. Houk, Denver, Colo.

Sun Bath for Milk Pails

After a milk pail has been emptied and washed, there still remains a thin film of milk on the inside, and this turns into lactic acid, which hastens the souring of milk put in the pail. The film is very thin and the ultraviolet rays of sunlight, says Prof. Gilbert L. Houser, of the university of Iowa, are deadly to the microscopic bodies which produce lactic acid. So, exposing the inside of the pails to the sunlight will enable one to keep milk sweet for several hours longer than if this precaution were not taken.

Drying the Fish Line

Winding a fish line on the reel when wet and storing it away for any length of time is bound to injure it more or less as the strands, whether silk or cotton, will eventually decay from the presence of moisture. A practical little device which overcomes this difficulty is shown in the accompanying illustration. A strip of metal is cut and bent in the manner indicated to clamp around the pole just in front of the reel. Within the jaws of the clamp a folded strip of felt is placed in such a position that a setscrew passing through the clamp also penetrates and holds the felt. In use the clamp is turned to the upper side of the pole and the line is placed within the jaws. By turning the reel, the line is drawn through the felt, which removes the water. The clamp may be turned downward to be out of the way when casting is being done.—G. E. Hendrickson, Argyle, Wisconsin.



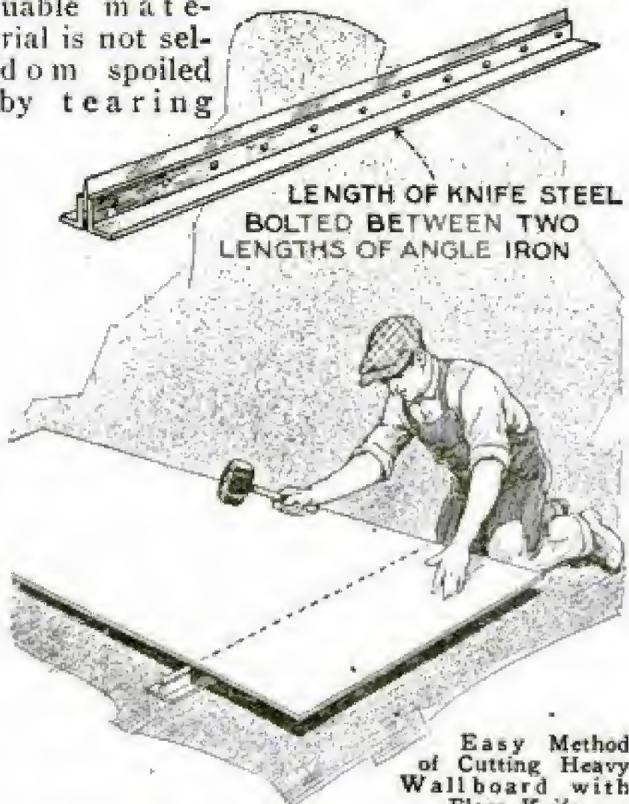
ward to be out of the way when casting is being done.—G. E. Hendrickson, Argyle, Wisconsin.

Pouring Lubricant into Grease Cups

In a Washington auto-service station, specializing in oiling and greasing cars, an unusually handy trick for filling the many grease cups and the grease gun, is in use. The workmen keep the grease can on the side of a small stove where the grease is heated to a fluid. It is then an easy matter to pour this into the cups and into the grease gun.

Cutting Wallboard

Cutting wallboard with a hacksaw is a tedious and time-consuming task, and valuable material is not seldom spoiled by tearing.

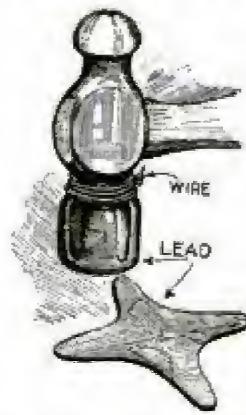


Easy Method
of Cutting Heavy
Wallboard with
Floor Knife

or breaking it. To avoid this, a Wisconsin contractor devised the simple floor knife shown in the drawing, which cuts quickly and always with a clean straight edge. A 4½-ft. length of knife steel, about 2 in. wide, was sharpened and bolted between two equal lengths of angle iron, as shown, the knife-edge protruding about $\frac{3}{4}$ in. This device was placed upon the floor, and the wallboard cut along the desired line by placing it on the knife and pounding with a rubber-covered mallet.

Improvised Soft Hammer

If a mechanic has no soft hammer, the following suggestion for making his own will be found useful. Cut out a round piece of sheet copper or lead, and cut in four wings to the shape indicated in the illustration. As the metal is soft and pliable it can readily be bent over the head and shank of the hammer. The four projecting legs are then fastened around the neck by means of a piece of wire twisted together securely.—M. J. Quoits, Philadelphia, Pa.

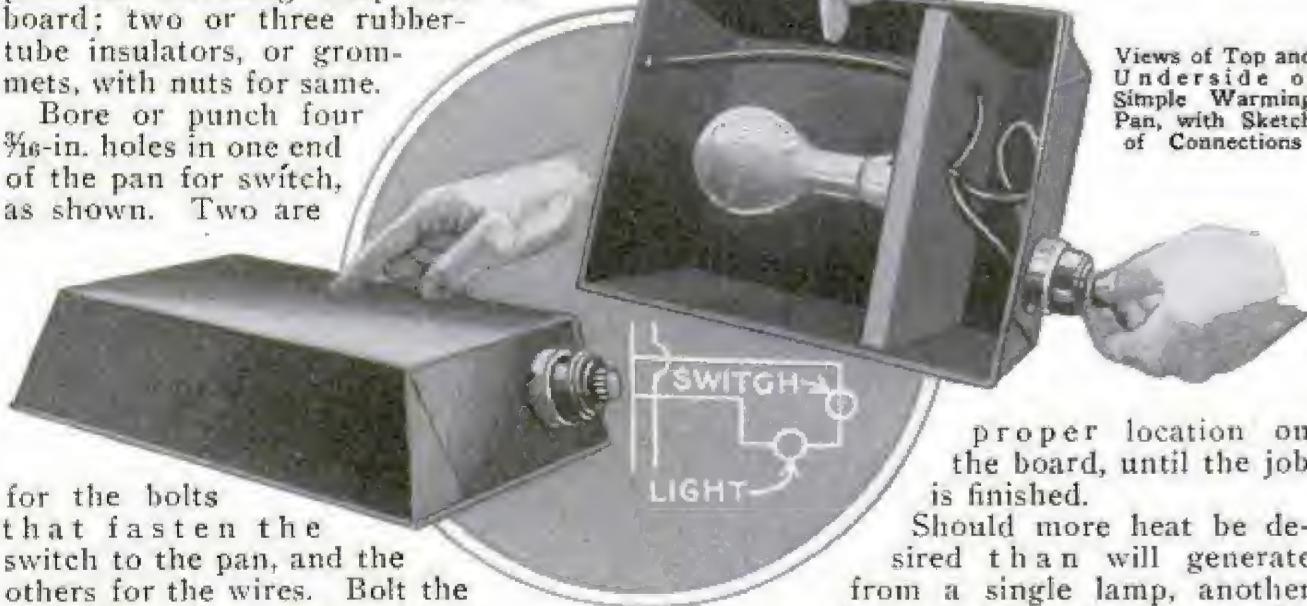


A Warming Pan for Your Dark Room

By RICHARD C. TARR

AN efficient and economical warming pan may be easily made from a common deep roasting pan, the total cost of which is about \$1.60. The materials needed are as follows: One black-iron roasting pan (the one pictured measures $9\frac{1}{2}$ by 14 in. inside, and 4 in. deep); one snap switch; one lamp socket, plain wall-type, keyless; one 100-watt lamp, nitrogen or gas-filled (may be smaller if less heat is desired); one attachment plug; 6 to 12 ft. of sadiiron double lampecord (preferable to twisted cord, even though its cost is a trifle more, as it is covered with asbestos, and resists heat); two brass bolts, $\frac{1}{8}$ by 1 in. for attaching switch to pan; screws and small nails for attaching board to pan and fastening lamp base to board; two or three rubber-tube insulators, or grommets, with nuts for same.

Bore or punch four $\frac{1}{16}$ -in. holes in one end of the pan for switch, as shown. Two are



for the bolts that fasten the switch to the pan, and the others for the wires. Bolt the switch in place, and make a hole in the opposite end of the pan, large enough to permit a hard-rubber insulator to be fastened, through which to insert the cord. Select a short piece of pine wood, $\frac{1}{8}$ by $3\frac{1}{2}$ in., for the lamp base, and saw to fit the pan, as shown. Bore two $\frac{1}{4}$ -in. holes through the center, about $2\frac{1}{2}$ in. apart. Screw the lamp socket between these holes, gauging the proper location, so that it will be about $\frac{1}{4}$ in. from the pan bottom and clear of a rule placed across the top. Then mark the outline of the socket base on the board, remove the lamp and screw the socket into place. When finished, the lamp should clear the pan itself and also the material upon which it rests. The socket should be about midway between the holes in the board, to permit the ends of the lampecord to pass through and be attached to the terminals of the socket. The wiring is simple. One of the cord wires is led to one side of the switch, the other to one side of the lamp

socket. The free terminals of the switch and socket are then connected to each other. As the neater arrangement of introducing the cord is through the back of the pan, a $\frac{3}{8}$ -in. hole is made through the board, so as to hold the cord to one side and prevent it from coming in contact with the lamp. Fasten the board to the pan with screws or nails to maintain the position shown. To the other end of the cord the plug is attached. The lamp, to prevent breakage, should not be screwed into the socket, except to gauge the

proper location on the board, until the job is finished.

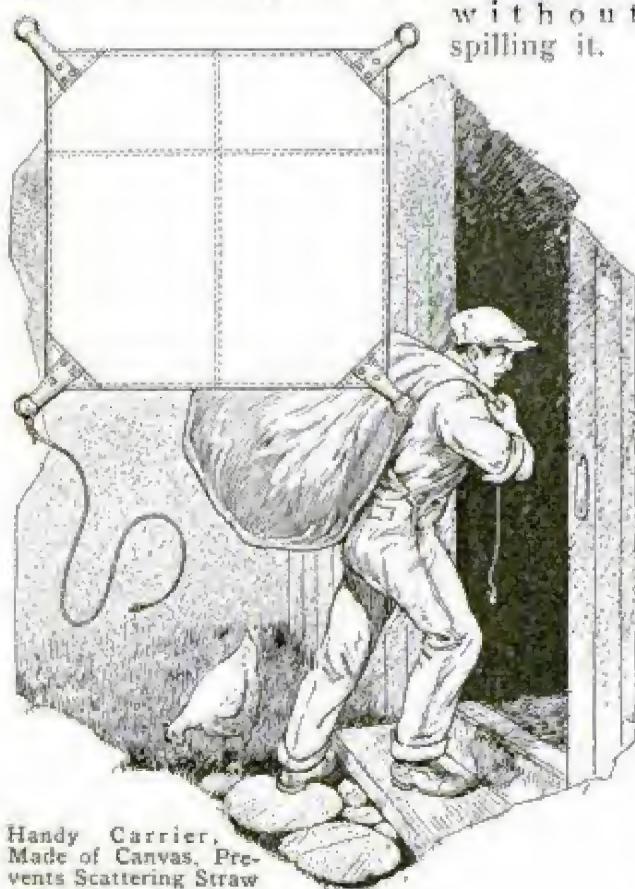
Should more heat be desired than will generate from a single lamp, another socket and lamp may be readily added. In operation, the pan rests upside down on a sheet of asbestos or corrugated strawboard (cut from an old carton). The air cells in the last-named material prevent the greater part of the heat from blistering or scorching the table upon which it may rest, although two thicknesses should be used over a highly finished or varnished surface. If not sprung in the making, the pan will be light-tight, or nearly so, if for use during development of plates or printing in the photo laboratory. All light may be prevented from escaping if the pan is set on a couple of layers of weather-strip felt, glued to the strawboard, as shown.

The heat produced is steady and penetrating. A 100-watt nitrogen lamp will give a surface heat of 150° F. and more, without trouble. This amount, used intermittently, will keep a pan of developer "up to snuff" in a cool room, or maintain a good heat in a pan of toning solution.

A special print, needed in a hurry, can be dried quickly on a ferrototype tin, with the use of the pan. If not needed in the laboratory for heating purposes, it makes a pretty fair floodlight for taking photos at night, and the writer has used it as such. Also, it has uses in the kitchen.

Handy Straw or Litter Carrier

To carry straw or litter to the poultry house or stable, or wherever it is to be used, cannot be done without scattering some of it along the way unless you have a carrier of some kind. A carrier can be made at little or no cost. Get three 100-lb. bags, such as poultry and chick feed is shipped in. These usually are made of burlap or other heavy cloth, but, if not available, old grain bags will do. Rip the seams apart and sew the edges together to form a large sheet about 6 or 7 ft. square. Hem the edges so that they will not tear or get fringy. At each corner, on both sides, stitch a triangular piece of tough cloth, such as canvas, and also an old harness ring. Get a piece of $\frac{3}{8}$ -in. rope, 7 ft. long, and tie one end to one of the harness rings. Spread the sheet out, put on as much straw as you can easily carry, pass the rope through the remaining three rings and pull up until the corners come together. You can then carry three or four times as much straw as you could with a basket or by the armful and without spilling it.



Handy Carrier,
Made of Canvas, Pre-
vents Scattering Straw



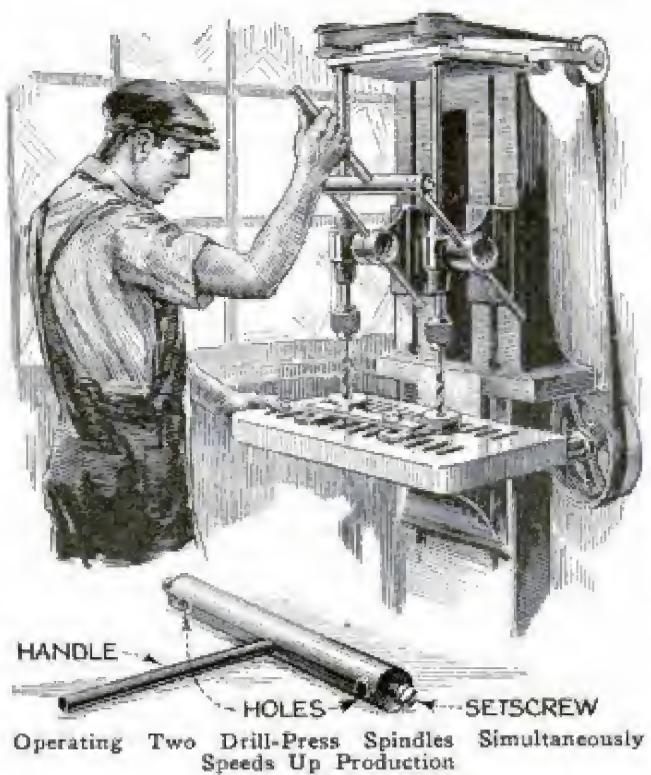
How Rear Part of Old Cab Is Used for Stand

Novel Cab Stands

Instead of disposing of their old car bodies, the Omaha Yellow Cab Co. use them as stations. Only the rear half of the body is used. It is repainted and attached to the wall of a building as shown in the photo. A desk and telephone are installed, and the rear seat gives the operator plenty of room and comfort. These cab stands are unusually attractive and with an electric sign above them can readily be located.—John T. Bartlett, Boulder, Colorado.

Boiler-Front Polish

Application to boilers is the hardest test that paint can be put to, as some parts of the steel and cast iron are only warm and other parts very hot, and most paints will blister and peel off in patches after the boiler has been used for a short time. A boiler should be out of service when it is being painted. For a number of years one plant has used graphite plumbago mixed with water to the consistency of paint, applying it with a brush. After it is dry it is polished with waste or a cloth. Very little rubbing is required and a smooth finish of a blue color will be imparted. This finish remains indefinitely and all that it requires is a dusting. Before the graphite plumbago is applied all the old paint must be scraped off.



Operating Two Drill Spindles at Once

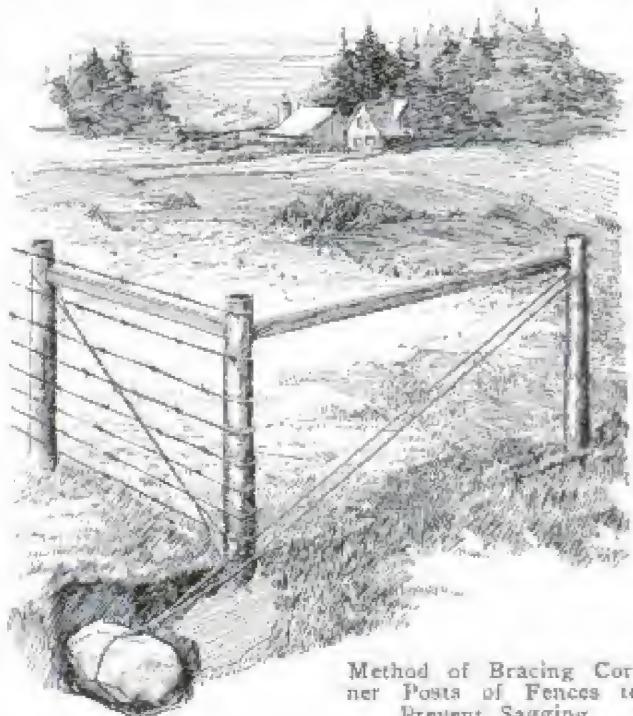
In many instances the output of a multiple-spindle drill press can be doubled by the simple expedient of coupling up two spindles so that they can be operated as one. The drawing shows the coupling bar and handle used in one shop for this purpose. The device consists of a straight bar drilled at each end to go over the spindle handles, tapped for screws to tighten it in place, and drilled in the center for a drive-fit handle. It will be found that the length of movement on most machines will allow of holes about $\frac{3}{4}$ in. deep. Thus, short through holes can be best drilled in this way, and the set-up will, of course, vary according to the job. Two vises clamped on the table are handy for many pieces, in other cases parallels will keep the work from turning and make for quicker production.

Beauty Clay Aids Babbitting

When bearings are to be babbitted it will be found advantageous to preheat the babbitting mandrel and also the shell to be babbitted from 100 to 250° F. However, a homogeneous bearing is not always obtained in this way. Make a mixture of ladies' beauty clay and water to the consistency of medium lubricating oil, and paint the mandrel with this after it has been heated. This will make a coating about .003 to .004 in. thick, which will draw the moisture from the metal, insuring a solid bearing.

Bracing Fence Corners

Fences can often be kept from sagging by properly bracing the corner posts. A good method of doing this is shown in the drawing. Set the corner post about 3 ft. in the ground and the next post to the same depth and about 8 or 10 ft. from the corner. Wedge a length of 2 by 4-in. wood between these posts, about 6 in. from the top. A heavy rock is to be placed in the position shown, a hole being dug for this purpose. The hole should be about 2 or 3 ft. deep and some solid earth should be left between it and the post. Now take heavy smooth wire or barb wire, loop and twist it securely around the rock so that it cannot be pulled off readily, then drop the rock into the hole, tamping the ground over and around it firmly. Cut a narrow trench in the ground between the rock and the corner post for the brace wire to rest in. The wire should be brought around the second post about 6 in. below the top. Draw the wire tight and staple it well to the second post. After this is done twist the brace wire between the two posts with a pair of pliers or a piece of steel bar; then stretch the horizontal wires. There will



Method of Bracing Corner Posts of Fences to Prevent Sagging

be no appreciable strain on either post as most of the strain is taken by the rock. I placed corner posts in this manner in loose sandy soil 10 years ago, and they are still standing just as straight as they did at first.—Wm. Bathlot, Taos, New Mex.

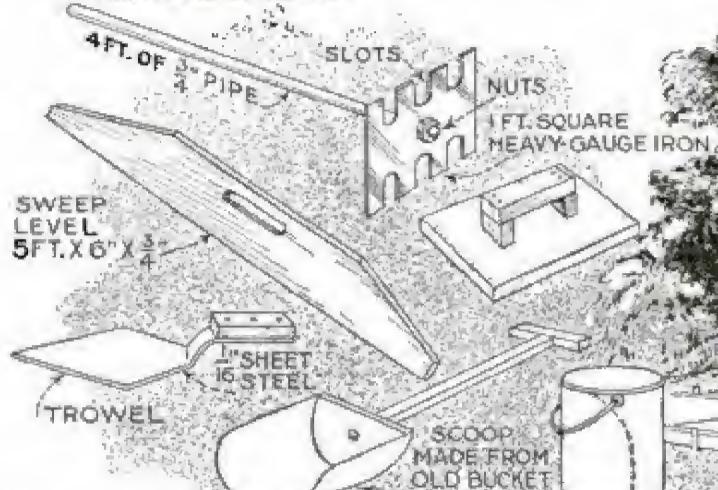
Never leave a machine after using it without cleaning it thoroughly.

Homemade Tools for Small Concrete Jobs

By G. A. LUERS

WHERE there are only occasional calls for a small concrete job, and the amount of work does not seem to justify

MIXER AND SPREADER

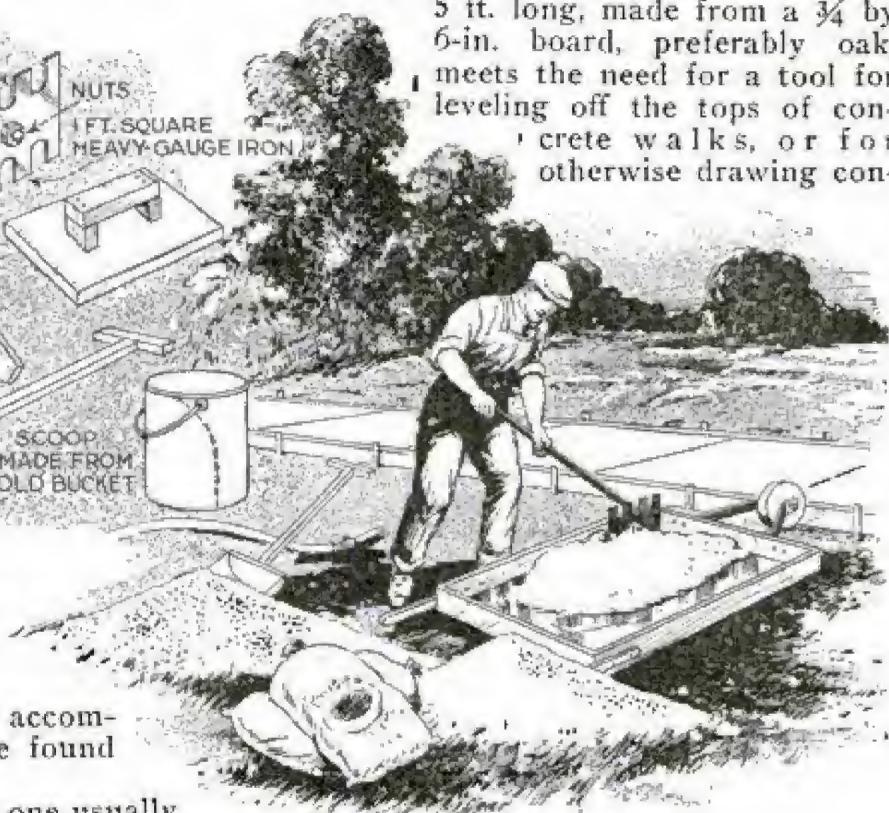


Tools for the Occasional Concrete Job around the Home or Farm Simply Made from Material to Be Found on the Scrap Pile

any great expenditure for tools, those shown in the accompanying illustration will be found very handy.

The first thing for which one usually has to hunt is a mixing board. It will be found to save time in the end to make a board, as shown in the drawing, and keep it for future jobs. This consists of a shallow box, about 4 ft. square, fitted with a small roller or wheel and two handles, like a wheelbarrow, to facilitate moving the board about, and to aid in carrying the other tools and materials to the job. A mixer or hoe, of heavy sheet iron or steel and provided with a handle

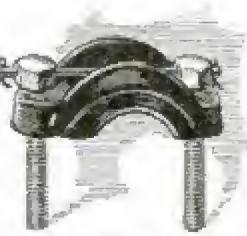
made from $\frac{3}{4}$ -in. pipe, will be found a very useful tool, as is also the trowel of the same material with a wooden handle riveted to it. A "sweep level," 5 ft. long, made from a $\frac{3}{4}$ by 6-in. board, preferably oak, meets the need for a tool for leveling off the tops of concrete walks, or for otherwise drawing con-



crete rapidly to an even surface. A wooden float, about 12 by 14 in., will work up a wet top surface on the concrete, and may also be used as a mortar board for small jobs. The scoop measure is made from an old bucket, in the manner shown in the illustration. The size of this being immaterial, it may be chosen to suit individual taste and can be made from any suitable article on hand.

Locking Motor-Support Bolts

Some automobiles have front motor-support bolts, which are often difficult to tighten unless the radiator is removed, as it is impossible to place a wrench on the bolt heads, while tightening the nut from below the supporting frame. The idea shown in the illustration remedies this trouble. The bolt heads are drilled with as large a drill as the head will safely accommodate, and after the bolts are in place, a steel bar is inserted in the holes in the heads, the bar having cotter-pin holes outside each bolt



head. The bolts are easily tightened whenever desired as they will not turn and are as easily removed by sliding the locking bar out of the holes in the heads.—Edwin Kilburn, Spring Valley, Minn.

Ducks Keep Ditches Clean

A western farmer has found that the mosslike plants which grow in irrigation canals during the summer months, sometimes to such an extent as to interfere seriously with the flow of irrigation water, can be kept down in the small shallow lateral ditches by ducks. The ducks swim back and forth along the ditches, eating the moss as fast as it grows, thus feeding economically and keeping the ditches open.

This May Be Your Home

1537



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Plan No. 5B22

QUESTIONS regarding home building addressed to this magazine will be answered by The Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and endorsed by the United States Chamber of Commerce. Inclose 10c and self-addressed envelope. Blueprints, specifications and material list for the house shown here may be obtained at nominal cost. Inclose self-addressed stamped envelope for reply. If further information is desired, send 5c and stamped envelope for a 24-page booklet explaining how the Small House Service Bureau functions and showing 12 sample plans. A new booklet, entitled "Fifty Ways to Lower Home Building Costs," illustrated by ten bureau houses actually lived in, and showing how as much as \$1,000 can be saved on a home, may be obtained for 20 cents.

THE bungalow has a host of friends. Its one-floor arrangement appeals to many, as it offers a coziness and a home atmosphere that are most pleasant. Also the elimination of stair climbing is a great factor in its popularity. In considering those things which go to make up a modern bungalow, there are three points to consider—economy of construction, convenience of arrangement, and a well designed exterior.

The design herewith is a true bungalow, for it is complete on one floor. Its fine arrangement of rooms can only be realized after a careful examination of the floor plan. Special attention has been given to such modern conveniences as a built-in tub and towel closet in the bathroom, space for the refrigerator in the rear entry, a niche in the hall for the telephone and a clothes chute to the laundry.

The living room is of good size, with windows on two sides and has a fireplace. The two bedrooms have cross ventilation. There are four clothes closets and two closets for linen.

The plans call for solid brick construction, although a stucco exterior finish could be used if preferred. Red flash brick with white mortar joints was used in the home illustrated here and in the roof occasional shingle courses were doubled.

Home Builders' Questions

Q. What is a fireplace damper? **A.** The connection between the fireplace and the flue is called the throat. This throat may be of masonry or of metal. If of metal, it can be equipped with a hinged plate called the damper. This damper may be moved so as to adjust the size of the throat to conditions of the fire.

Q. What is the difference between a septic tank and a cesspool? **A.** A septic tank is a scientific device made of two tight tanks suitably connected and arranged so that sewage deposited therein will be digested and made unobjectionable when discharged. A cesspool is simply a pit which may or may not have a drain. It is a source of contamination and may be very dangerous.

Q. The walks we put in last month when the weather was bad were not protected properly, and as a result have crumbled and gone to pieces. I paid \$75 for the job. **What can I do?** **A.** Get the contractor to replace them. If he will not do so, you may threaten suit.

Q. Please advise whether or not it is advisable to decorate a new home when it is built. **A.** Postpone the decoration of the new house until after it has had a chance to season. The walls may settle somewhat, causing minor cracks in the plaster.

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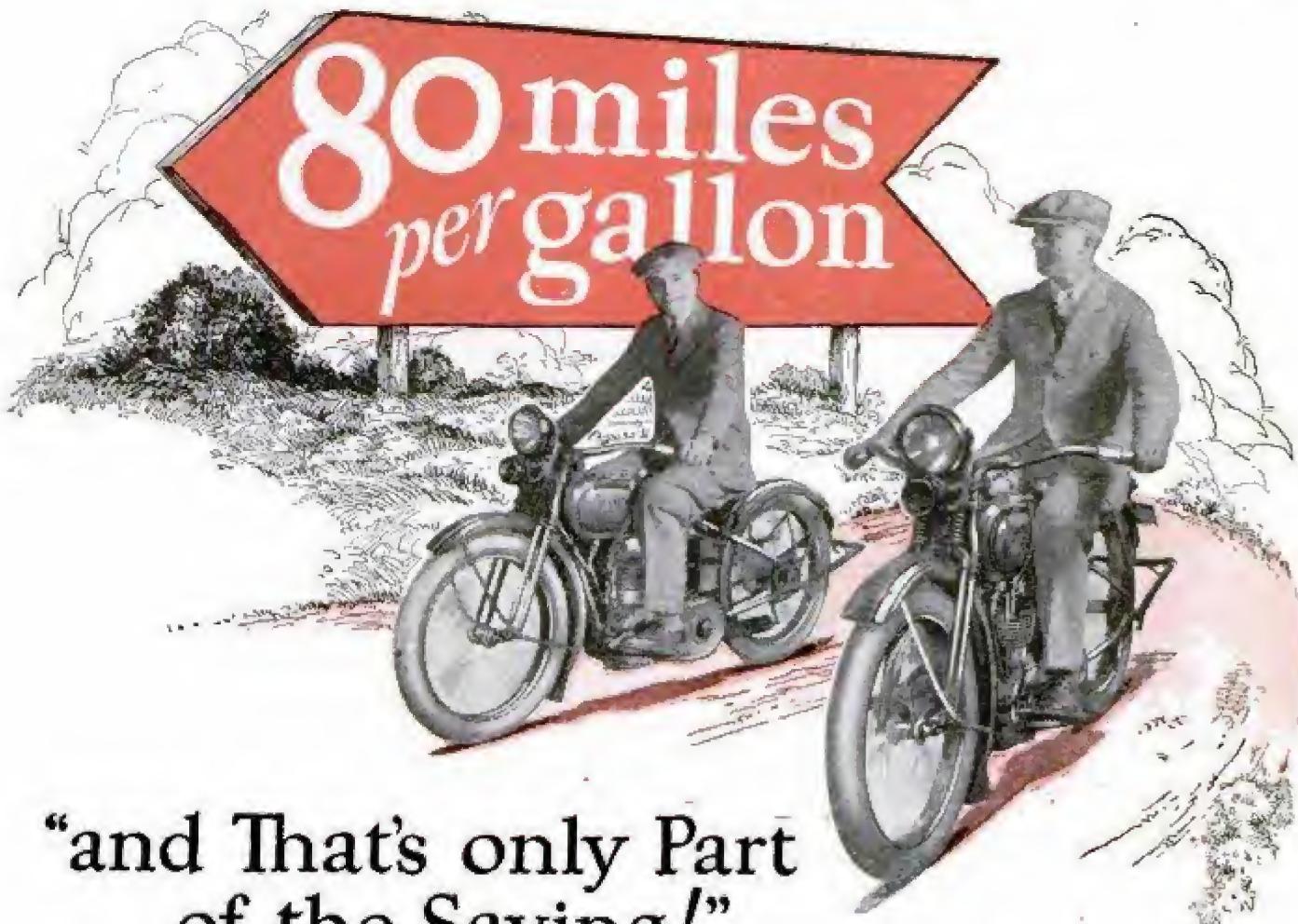
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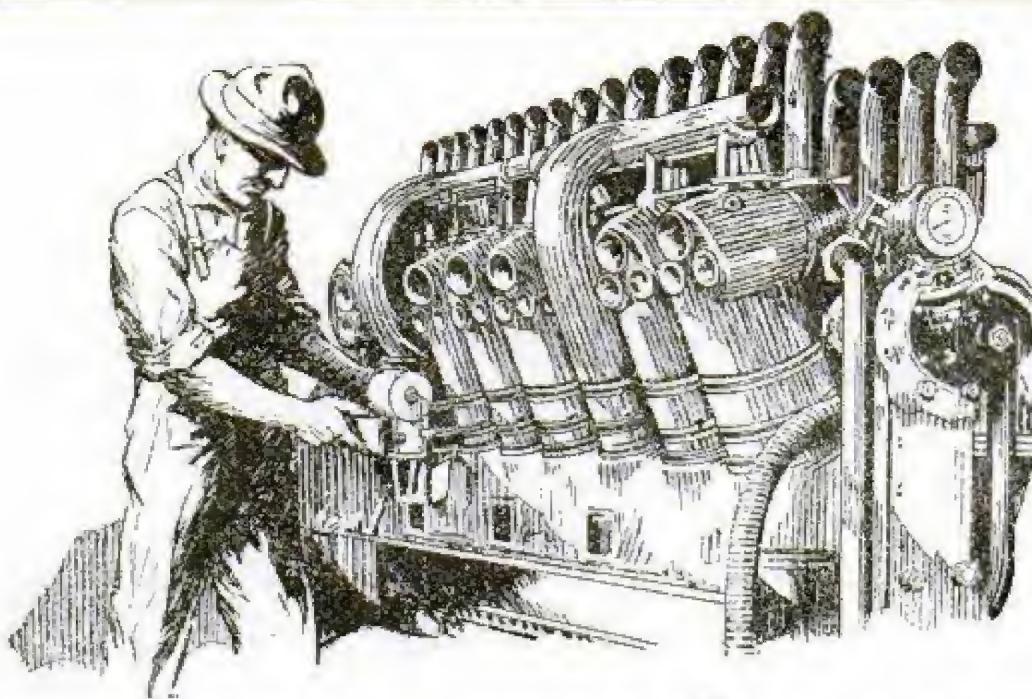
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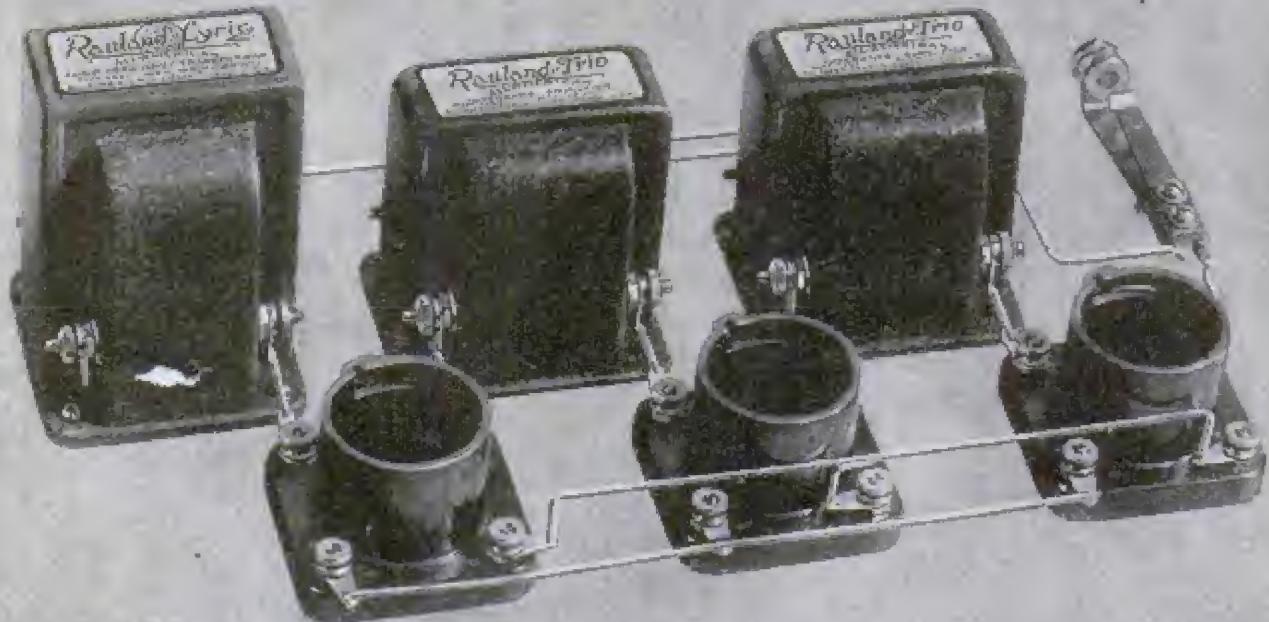
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You know the Rauland-Lyric transformer. Its exceptional tone perfection has made it the largest selling quality transformer in the world. The Rauland-Lyric is now used in combination with the new Rauland-Trio (impedance units) to produce the Rauland-Lyric-Trio amplifier—the highest known perfection in three stage audio amplification.

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This new method consists of a Rauland-Lyric transformer for the first stage, a Rauland-Trio Type R-300 impedance for the second stage, and a Rauland-Trio Type R-310 impedance for the third stage.

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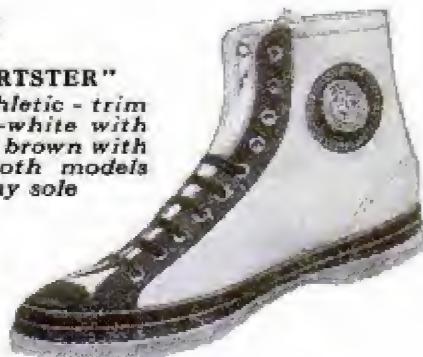
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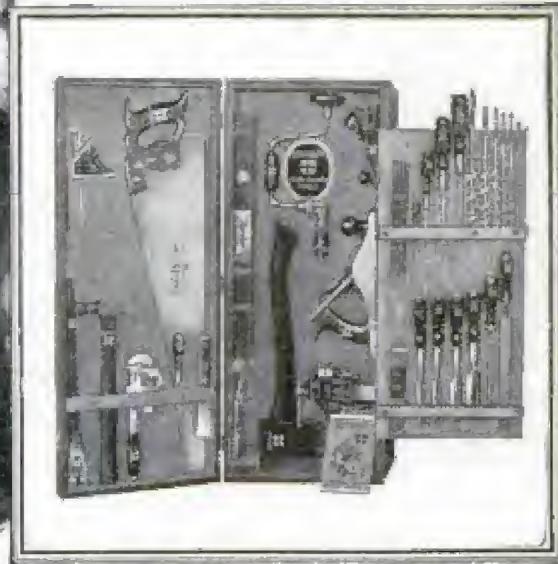
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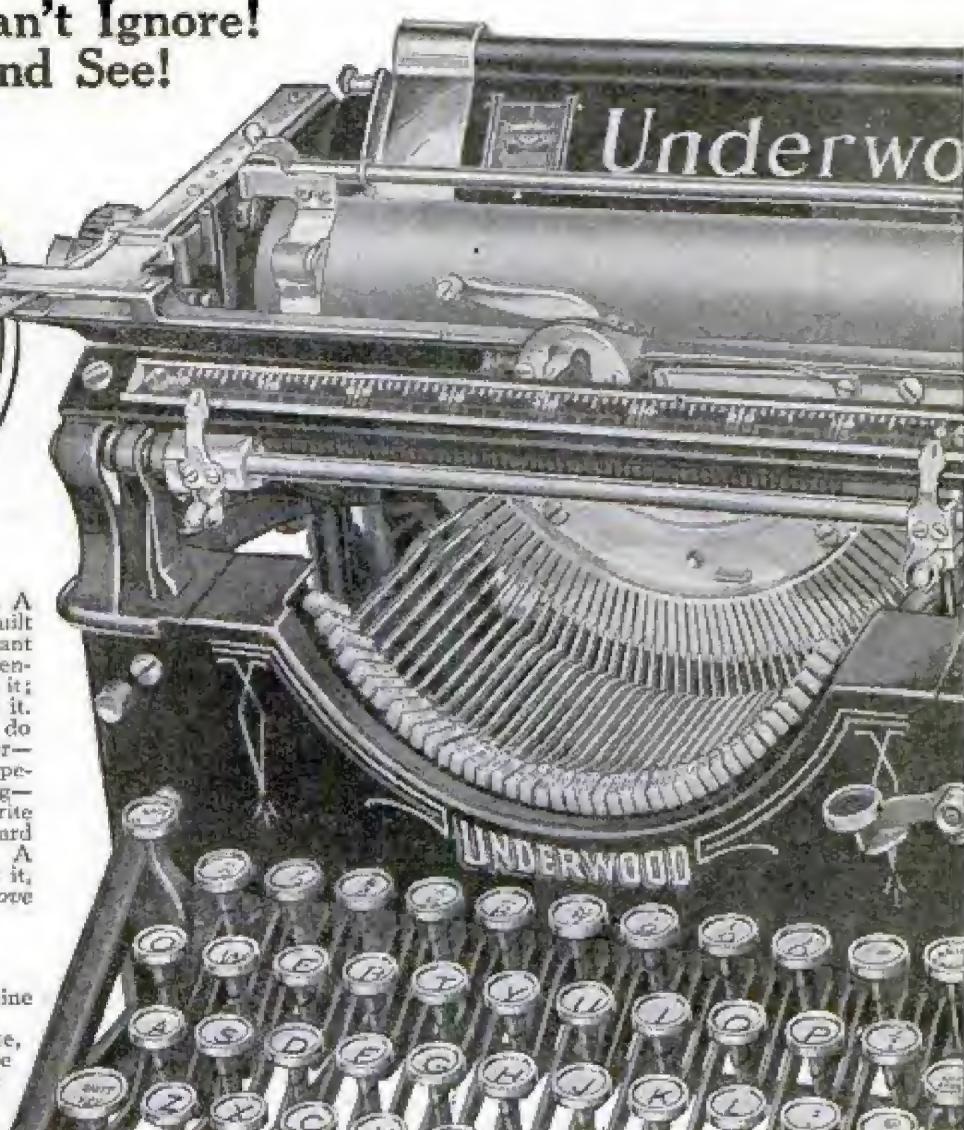
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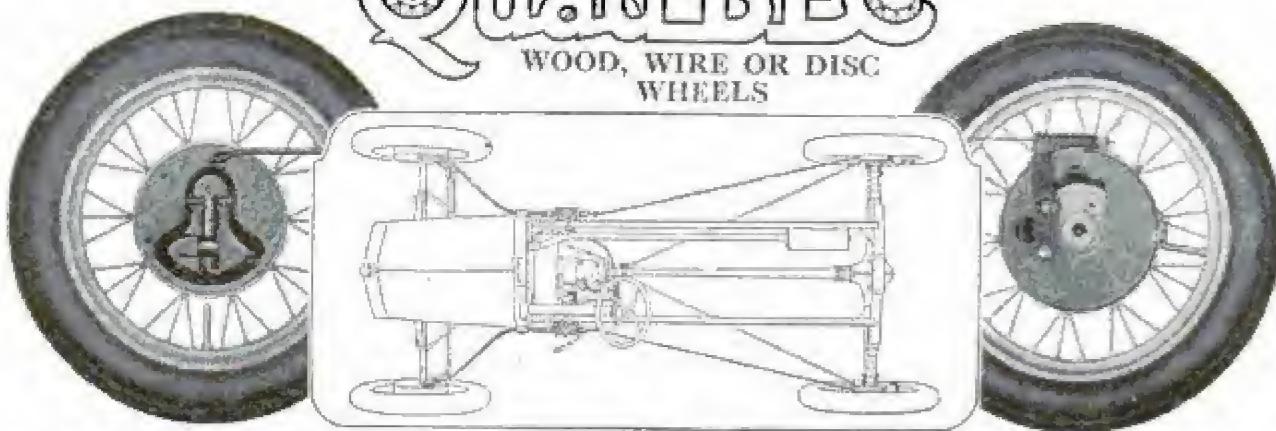


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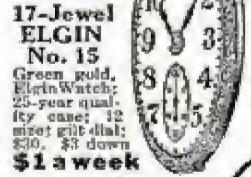
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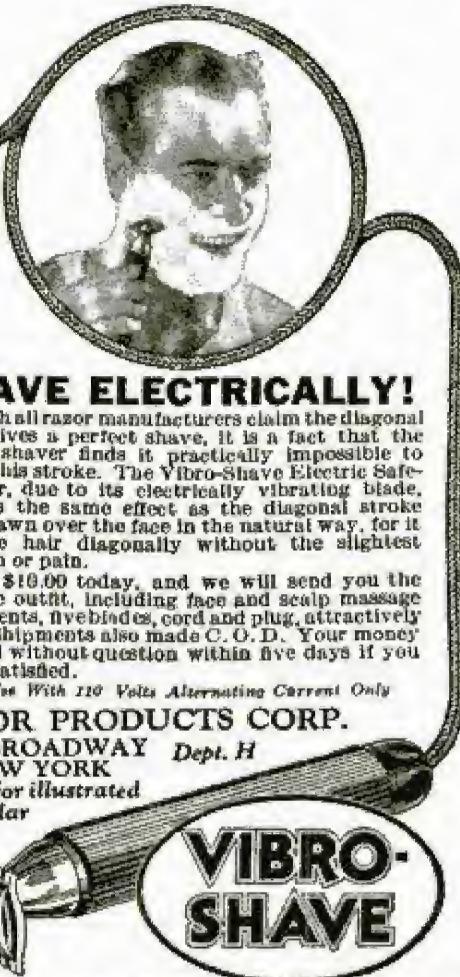


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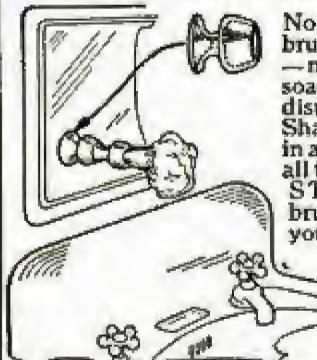
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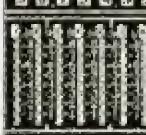
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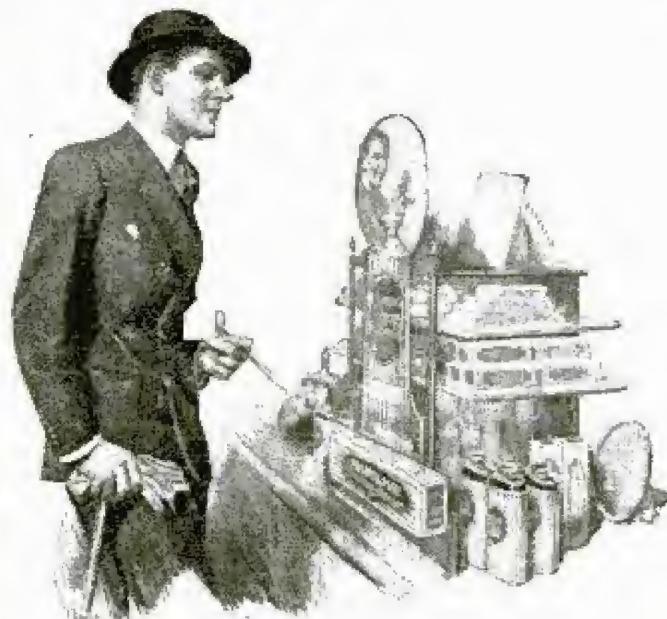
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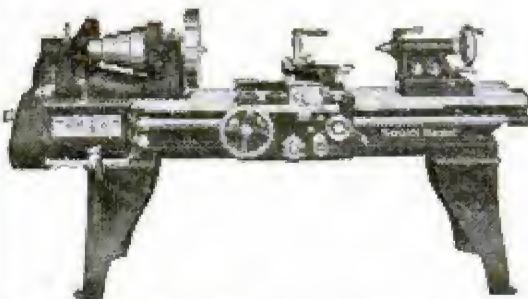
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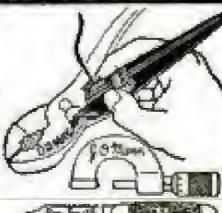
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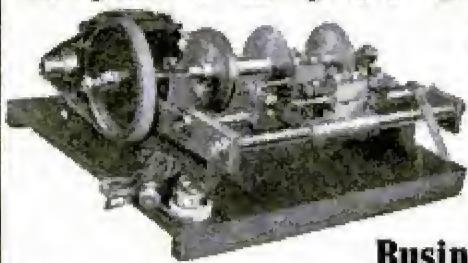
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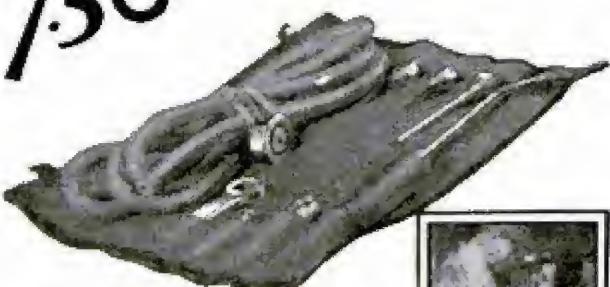
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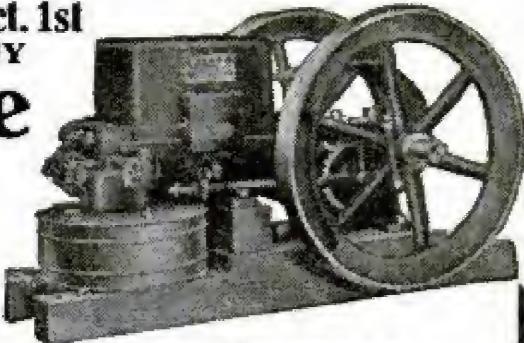
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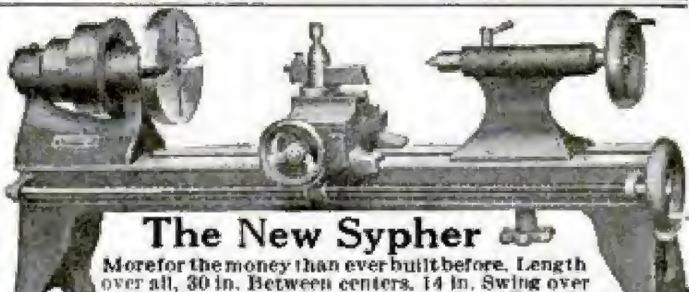
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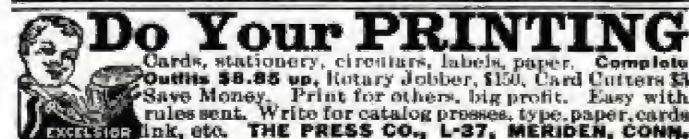
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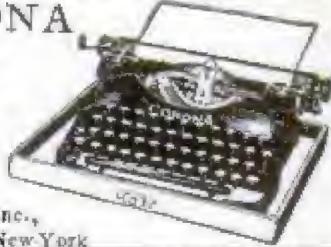
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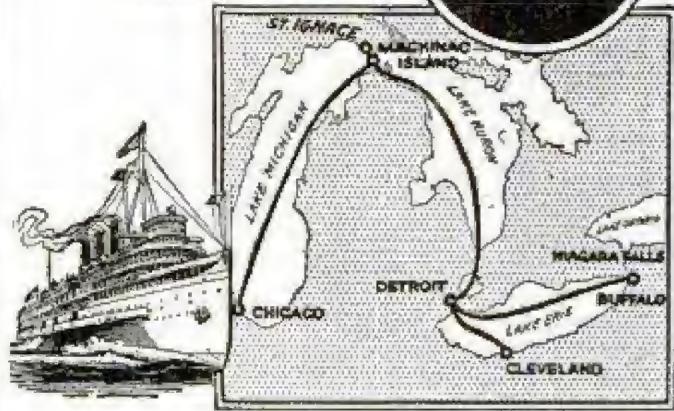
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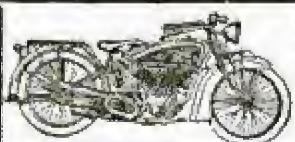
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"Old Town Canoes" are most graceful and attractive. Patterned after actual Indian models. Low in price, too. Write for free illustrated catalog today. Old Town Canoe Company, 1867 Middle St., Old Town, Maine

"Old Town Canoes"

MAKE YOUR Ford INTO This Sport Car—Save \$50 to \$150 with Red-i-Kut Life-Size Patterns

Famous sure-fit RED-I-KUT life-size patterns and picture instructions show how you can easily convert your Ford into this Fast, Saucy, Sport Car as thousands have done with easily obtained materials. No need to lay up the car. Rear seat folded, making 4-passenger car. **Look at Willfred Egan's** Egan says: "It took me 5 Sundays to build it and I sure am proud to bear them now. He built that amazing sport car. I never cut any wood-work before, but I can't go wrong with Kuempel patterns."



St. Louis, Mo.

The Lark life-size patterns for each part of the body so you can't go wrong. Picture instructions and CONICAL DISK WHEEL PATTERNS. Only \$3.00 delivered. \$1 extra brings patterns for Jiffy Top and Gossen windshield. **RKD Steel for Lark \$10 complete.** Extreme Weight \$12. Order now while we can make good delivery. **Easy-to-Understand Instructions**

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38-inch Easy Riding Seat

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Tires Lamps, wheels and equipment, low prices. **No Money** do business direct with makers.

Mead CYCLE COMPANY DEPT. L, CHICAGO 108

Write today for free Ranger Catalog, factory prices and convenient easy payment terms



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MAKES YOUR BIKE A MOTORCYCLE!

A high grade 2½ H. P. motor attachment quickly clamped on any bike frame. Speed 4 to 40 miles an hour. 90 to 125 miles per gallon of gas.

Special Low Price Now! Write today for Complete Description and Special Low Prices on Shaw Motor Attachments and the SHAW Complete Motorbicycle.

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804-K

Broad St., Sioux Falls, S. D.

SOFT SNAP FOR AGENTS

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GLAROFF MFG. CO. 804-K, Broad St., Sioux Falls, S. D.

The "Lark" Class—Snap



38-inch Easy Riding Seat

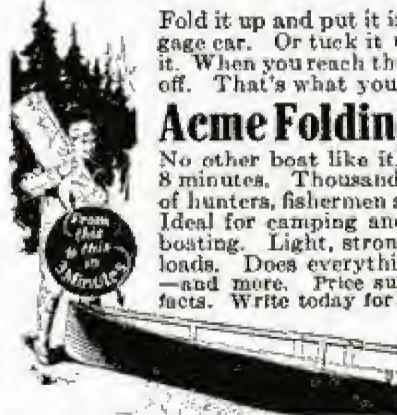
KEEPS YOU FROM RUST SPOTS

BERRY BROTHERS' "Handy Andy" TOUCH UP BLACK

Here is a high-quality, jet-black automobile finish that produces an effect closely resembling baked enamel and dries dust-free in one hour. The brush is part of the package—always soft, pliable and ready for use. No motorist can afford to be without Berry Brothers' "Touch Up Black" in the convenient and economical "Handy Andy" bottle. It takes only a moment to cover up a rust spot or scratch and keep a car looking slick and smart. Just unscrew the cover and remove the brush. Don't worry about results. Only clean writing will betray your work. If you don't dare write, have Berry Brothers' "Handy Andy" Touch Up Black, send us his name and \$1, and we will ship directly to you, prepaid, anywhere in the United States or Canada.

BERRY BROTHERS
Varnishes Enamels Stones
Detroit, Mich.

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Fold it up and put it in your auto, or in the baggage car. Or tuck it under your arm and carry it. When you reach the water, unfold it and shove off. That's what you can do when you own an

Acme Folding Boat or Canoe

No other boat like it. Fold or unfold it in 6 to 8 minutes. Thousands in use. The first choice of hunters, fishermen and sportsmen for 36 years. Ideal for camping and outing trips and pleasure boating. Light, strong, safe. Carries enormous loads. Does everything a wooden boat will do—and more. Price surprisingly low. Get all the facts. Write today for FREE catalogue.

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At Factory Prices!

Write for circular A-2 showing this De-Luxe Model and others.

\$22.75 AND UP



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Delco Ignition for Fords

*At A New
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Now you too can equip your Ford with the amazing new Delco Ignition at only \$13.00. Give your Ford high-priced car performance. New speed! A faster, hotter spark. Easier starting. And the saving in gas will be pleasing, too. With Delco coil, \$5.50 extra. Write for information or better yet, send money order, draft or express order for immediate shipment. Address

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Thompson BEATS the World on BOATS

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Our complete line of 22 models offers you a variety to choose from. Prompt shipment from factory to you. **Catalog Free—Save Money—Order by Mail** Please state kind of boat in which you are interested.

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Catch Fish Eel, Mink, Muskrats etc. with my New, Folding, Galvanized **STEEL-WIRE TRAP**. It catches them like a fly-trap catches flies. Made in all sizes. Light, strong and durable. **Get One Free**. Send for price list, free trap offer and my free booklet on best bait known for attracting all kinds of fish. Write today.

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You Can Save \$35.00

Recover it yourself. Custom tailor made to fit all makes and models. Roof and quarters sewed together, with rear fasteners, welts and tacks, complete. Anybody can put it on. Give name, year, model number of your car. Catalog FREE. Agents wanted.

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A New Scientific Principle without heat or cement. Instantly repairs punctures or blow-outs. Better—Quicker—Easier than vulcanizing. **ONCE ON—ALWAYS ON**. Every auto owner is a prospect. Repeat orders sure. Big profits. Appoint sub-agents.

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BERRY BROTHERS'
"Handy Andy"
TOUCH UP BLACK

Here is a high-quality, jet-black automobile finish that produces an effect closely resembling baked enamel and dries dust-free in one hour. The brush is part of the package—always soft, pliable and ready for use. No motorist can afford to be without Berry Brothers' "Touch Up Black" in the convenient and economical "Handy Andy" bottle. It takes only moment to cover up a rust spot or scratch and keep a car looking spick and span. Just unscrew the cover and remove the brush. Don't worry about results. Only slow scrubbing will betray your work. If your dealer does not have Berry Brothers' "Handy Andy" Touch Up Black, send us his name and \$1 and we will ship directly to you, prepaid, anywhere in the United States or Canada.

BERRY BROTHERS
Varnishes Enamels Stains
Detroit, Mich.

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Fold it up and put it in your auto, or in the baggage car. Or tuck it under your arm and carry it. When you reach the water, unfold it and shove off. That's what you can do when you own an **Acme Folding Boat or Canoe**

No other boat like it. Fold or unfold it in 6 to 8 minutes. Thousands in use. The first choice of hunters, fishermen and sportsmen for 26 years. Ideal for camping and outing trips and pleasure boating. Light, strong, safe. Carries enormous loads. Does everything a wooden boat will do—and more. Price surprisingly low. Get all the facts. Write today for FREE catalogue.

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Delco Ignition
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Now you too can equip your Ford with the amazing new Delco Ignition at only \$13.00. Give your Ford high-priced car performance. New speed! A faster, better spark. Easier starting. And the saving in gas will be pleasing, too. With Delco coil, \$5.50 extra. Write for information or better yet, send money order, draft or express order for immediate shipment. Address:

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The BEST that Skill and Experience can Produce
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Our complete line of 22 models offers you a variety to choose from. Prompt shipment from factory to you.

Catalog Free—Save Money—Order by Mail
Please state kind of boat in which you are interested.

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Catch Fish **Steel-Wire Trap**

It catches them like a fly-trap catches flies. Made in all sizes. Light, strong and durable. **Get One Free.** Send for price list, free trap offer, and my free booklet on best bait known for attracting all kinds of fish. Write today.

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Lowest Wholesale Prices in America. Shipped prepaid on approval. Make big money all or part time. No capital or experience. Sample sections furnished.

YOUR TIRES FREE! Simply send name today for valuable FREE BOOK; tells how thousands have gone into big business. SPECIAL AGENTS' OFFER. Wholesale Prices and FREE SAMPLE KIT. Write nearest address.

MELLINGER TIRE & RUBBER CO.
Dept. 415, Kansas City, Mo. Dept. 415, Philadelphia, Pa.
Dept. 415, Oakland, Calif. **WRITE NEAREST OFFICE**



You Can Save \$35.00

Recover it yourself. Custom tailor made to fit all makes and models. Roof and quarters sewed together, with rear fasteners, welts and tacks, complete. Anybody can put it on. Give name, year, model number of your car. Catalog **FREE.** Agents wanted.

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INSTANT WELD WELDS RUBBER INSTANTLY **Make \$200.00-\$500.00 Per Month**

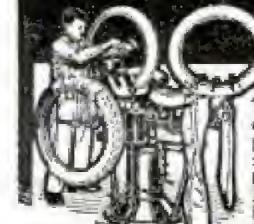
A New Scientific Principle without heat or cement. Instantly repairs punctures or blow-outs. Better—Quicker—Easier than vulcanizing. **ONCE ON—ALWAYS ON.** Every auto owner is a prospect. Repeat orders sure. Big profits. Appoint sub-agents.

Write for Free Sample Today.

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70,000,000 Tires in use. America's greatest opportunity for men with small capital. We furnish everything—\$100 and up. **Easy payments.** We train you **FREE** right at home. Start making money at once. Write today for **Free Book of Opportunity.**

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The greatest and most outstanding automotive invention of the past few years—banishes tire trouble forever. This wonderful new scientific discovery repairs a puncture instantly without taking the tire off wheel or rim. Actually makes any tire puncture-proof for life. Guaranteed not to injure tube, valve or tire. On the contrary, it preserves and lengthens the life of both tube and tire, often—

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"Old Town Canoes"

MAKE YOUR Ford INTO THIS Sport Car—Save \$50 to \$150 with Red-i-Kut Life-Size Patterns \$5.00

Famous sure-fit RED-I-KUT life-size patterns and picture instructions show how you can easily convert your Ford into this Fast, Fancy, Sport Car as thousands have done, with easily obtained materials. No need to buy up the car. Rear seat folded, makes 4-passenger car. Look at *Winfred Egan's* "It took me 3 days to build it and I sure am proud to have them say, 'He built that snappy sport car.' I never cut any steel or did any wood-work before, but one can't go wrong with Kuempel patterns." St. Louis, Mo.



The Lark life-size patterns for each part of the body so you can't go wrong, picture instructions and **CONICAL DISK WHEEL PATTERNS**. Only \$3.00 delivered. \$1 extra brings patterns for Jiffy Top and Garage windshield. **RKO Steel for Lark \$10 complete.** Extreme West \$11. Order now while we can make a good delivery and really enjoy the wonderful spring days in your Lark. **Keen, Classy, Up-to-the-minute. You can build it.** Over 15,000 in use. Don't hesitate. "Swing Let's Understand Irons, no frame cutting kind, \$5.99. Only \$2.99 when ordered with Lark patterns. Send 10 cents for actual body photo and new manual of other distinctive sport-life patterns from \$3.90 up. **RKO "Wind" Seating" Irons, Tops and Windshields.** **ORDER RIGHT NOW.**

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**SEE ALL
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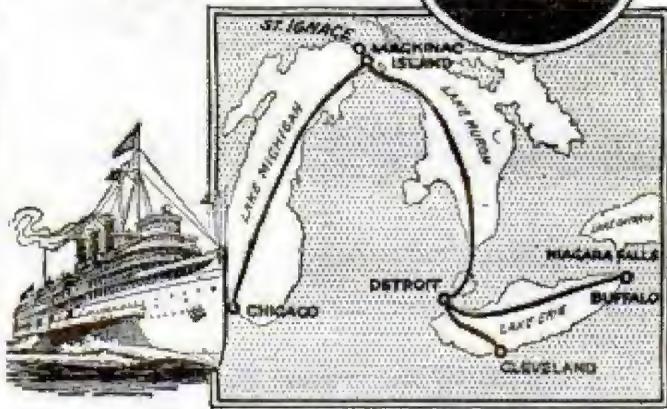
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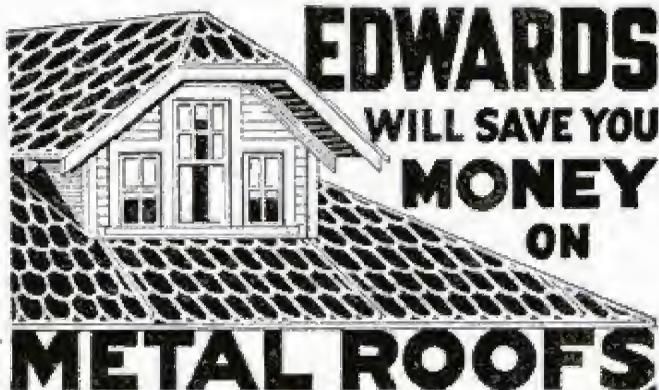
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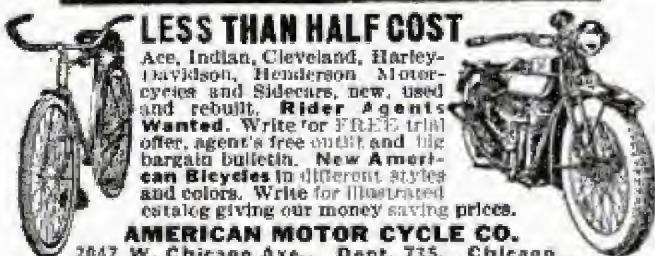
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Our net price list. Full line of auto bodies and accessories for Fords at Wholesale Prices. Save big money on bodies by buying Direct from Factory.

FOR FORD—Prices from \$27.00 up. Factory to consumer direct—Pay Only One Profit.

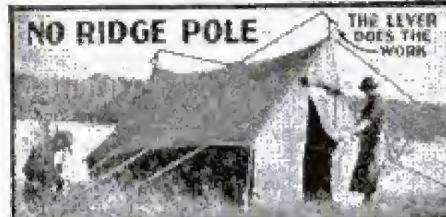
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Inc. Galvanized STEEL WIRE TRAP. Write for our FREE TRAP OFFER and Bargain Catalog of Fishing Supplies. \$1 Box of our Famous FISH BAIT FREE to introduce our traps. Our Bait makes them bite like hungry wolves. Agents Wanted.

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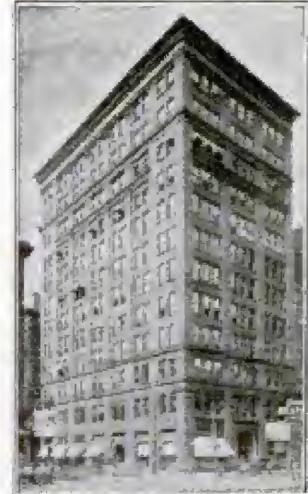
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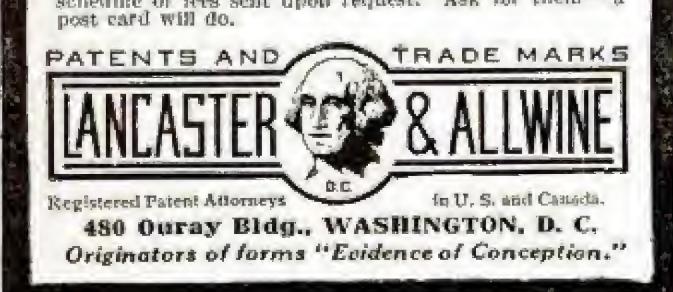
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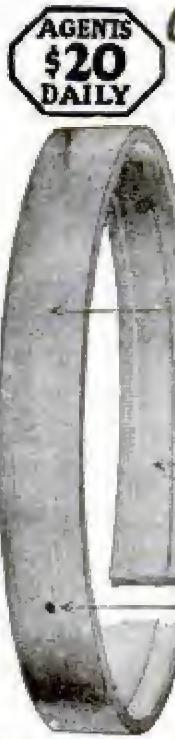
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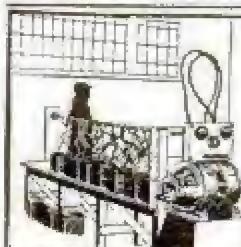
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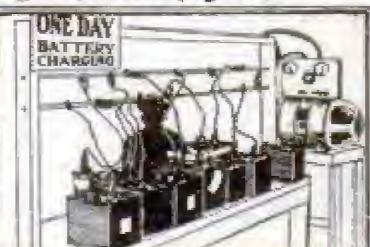
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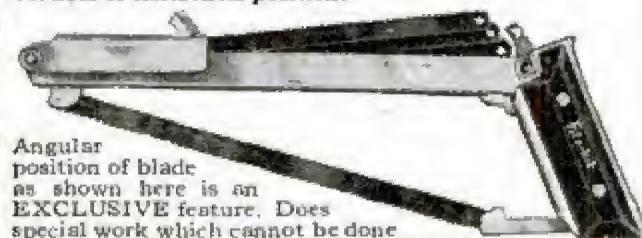
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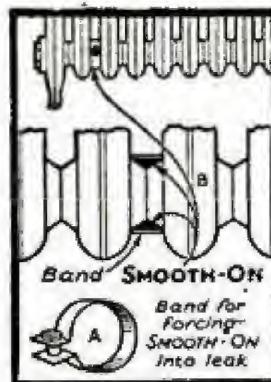
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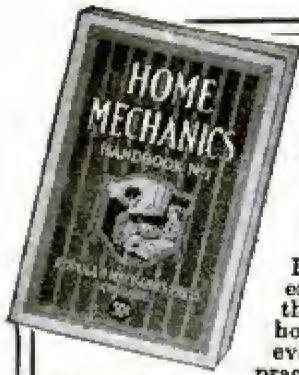
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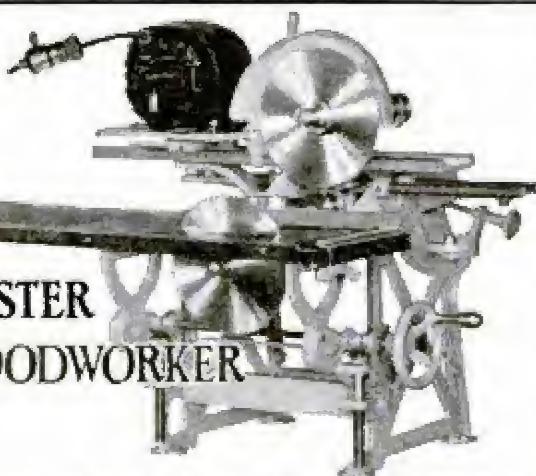
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Here is a complete woodworker, designed and constructed to cut production costs, speed up work and accomplish accurate tasks. The Master performs 12 distinct woodworking operations.

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Your name and address on the coupon below will bring you complete information about the work it does. Fill in the coupon NOW!

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Dept. H., 612 Brush Street, Detroit, Michigan
Send me complete information about the Master Woodworker.

Full automatic DELCO-LIGHT

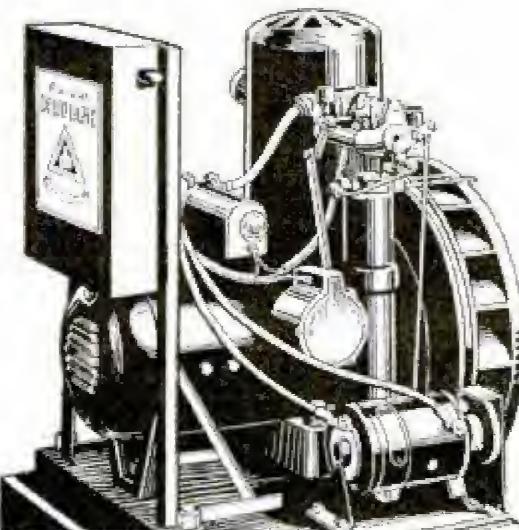
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A small down payment puts it in your home.

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DELCO-LIGHT COMPANY
Subsidiary of the General Motors Corporation
Dept. Q-40, Dayton, Ohio



DELCO-LIGHT COMPANY
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To introduce this marvelous device—for a limited time—we have arranged a plan whereby anyone can secure one of these SUPER CARBUREATORS for only one cent. Just send your name and address and we will mail you full FREE PARTICULARS—and also explain how you can make \$60 to \$150 PER WEEK.

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together with 20" band saw make a very satisfactory outfit of machines for the small shop. Ask today for complete information.

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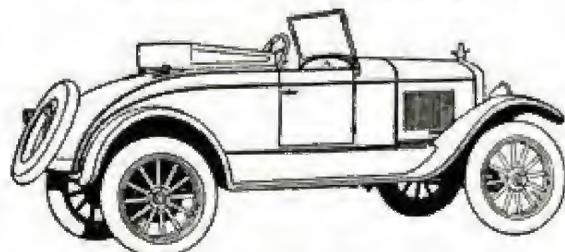
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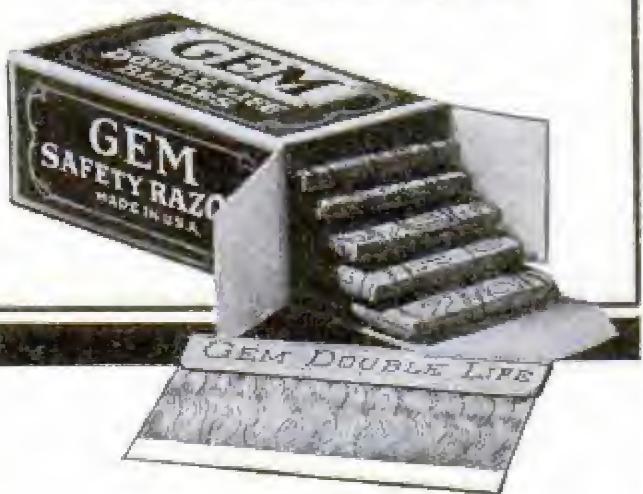
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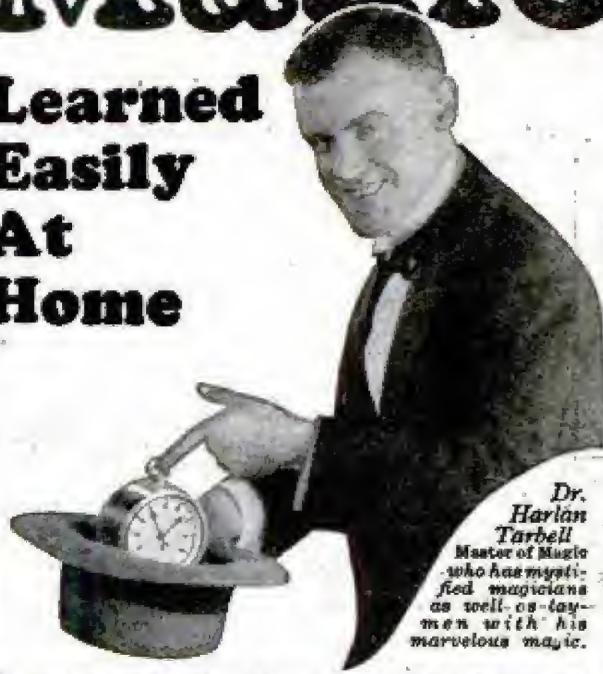
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Master of Magic
who has mysti-
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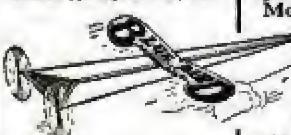
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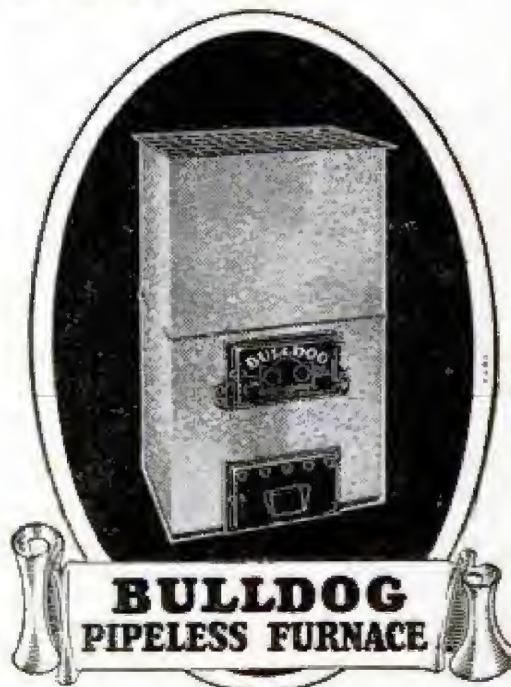


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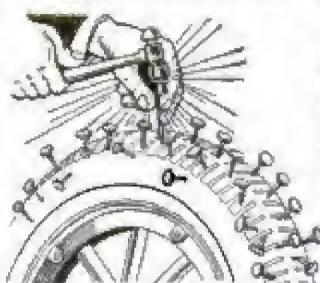
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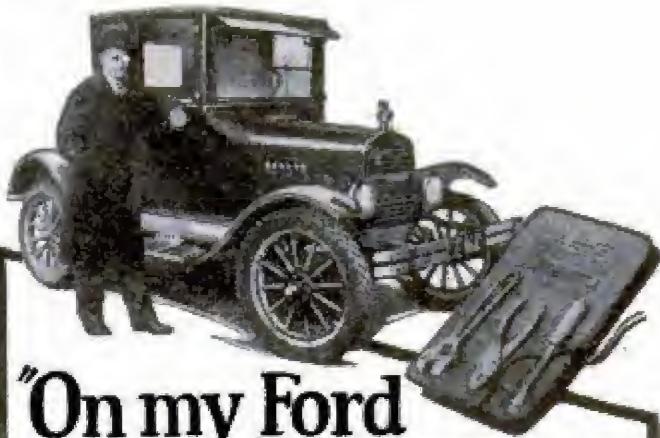
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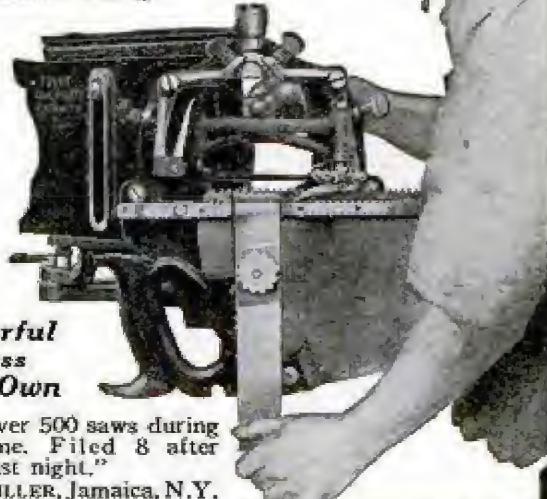
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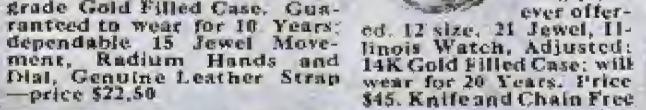
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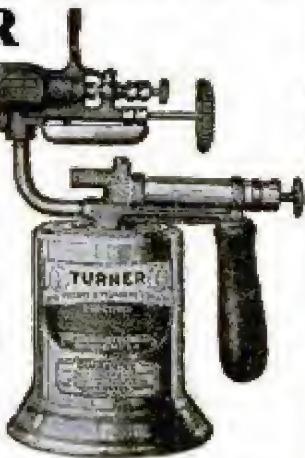
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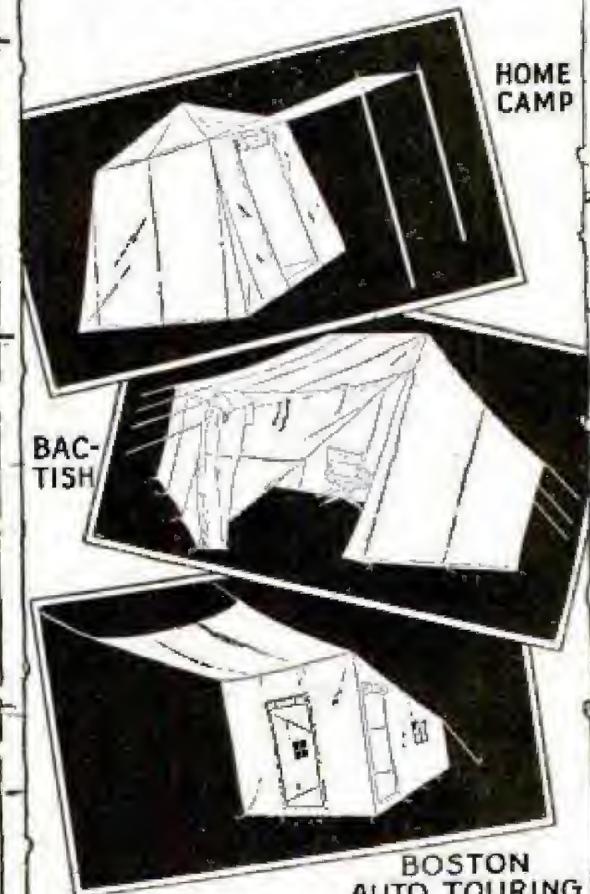
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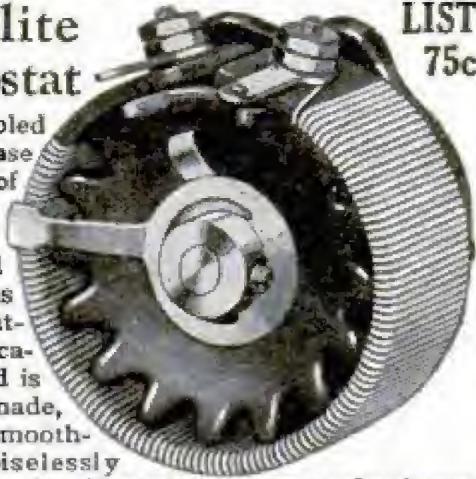
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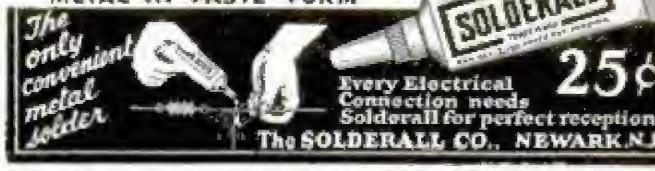
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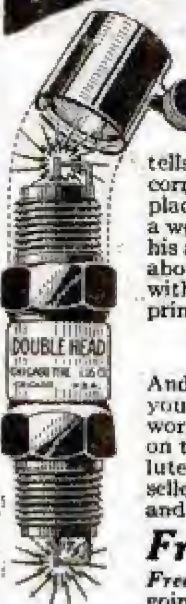
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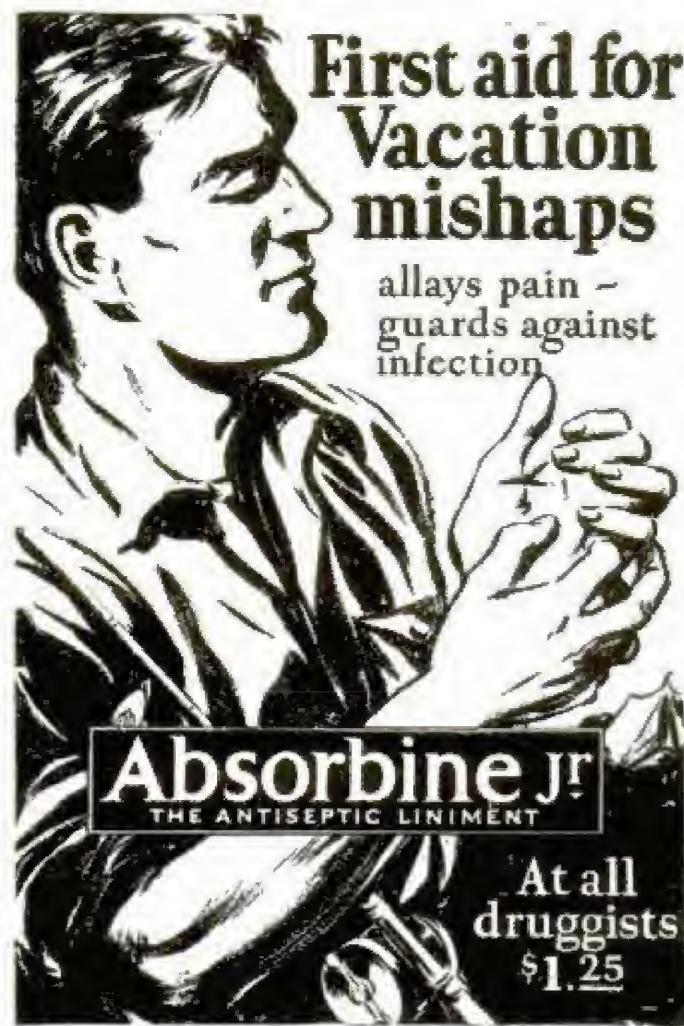
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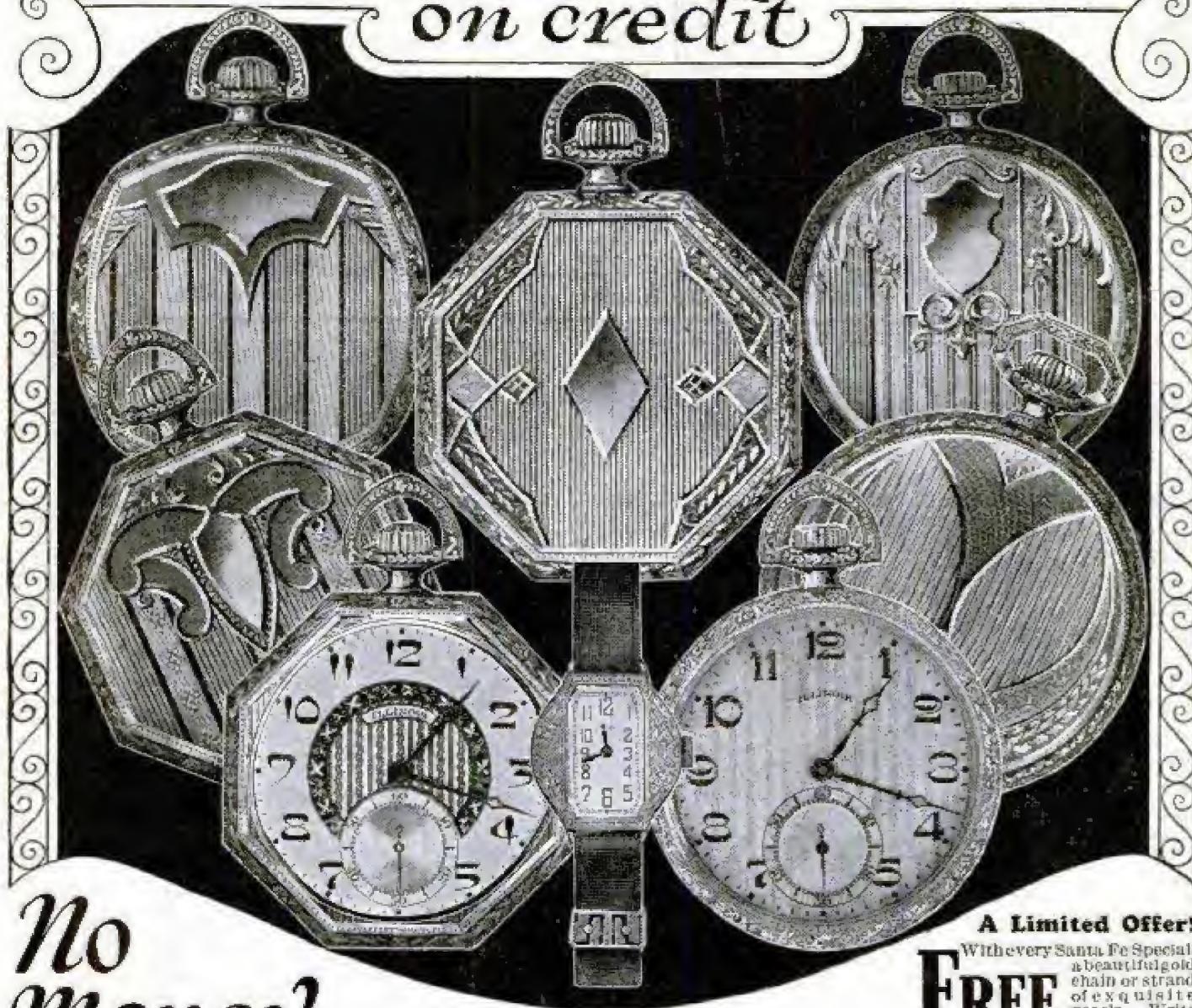
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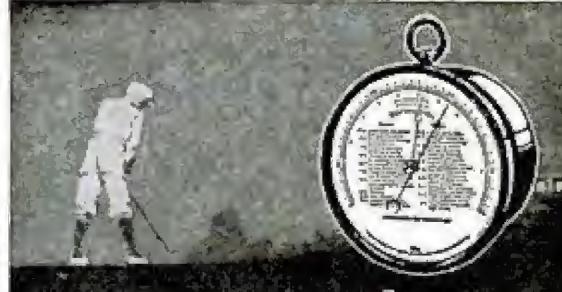
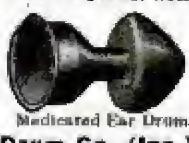
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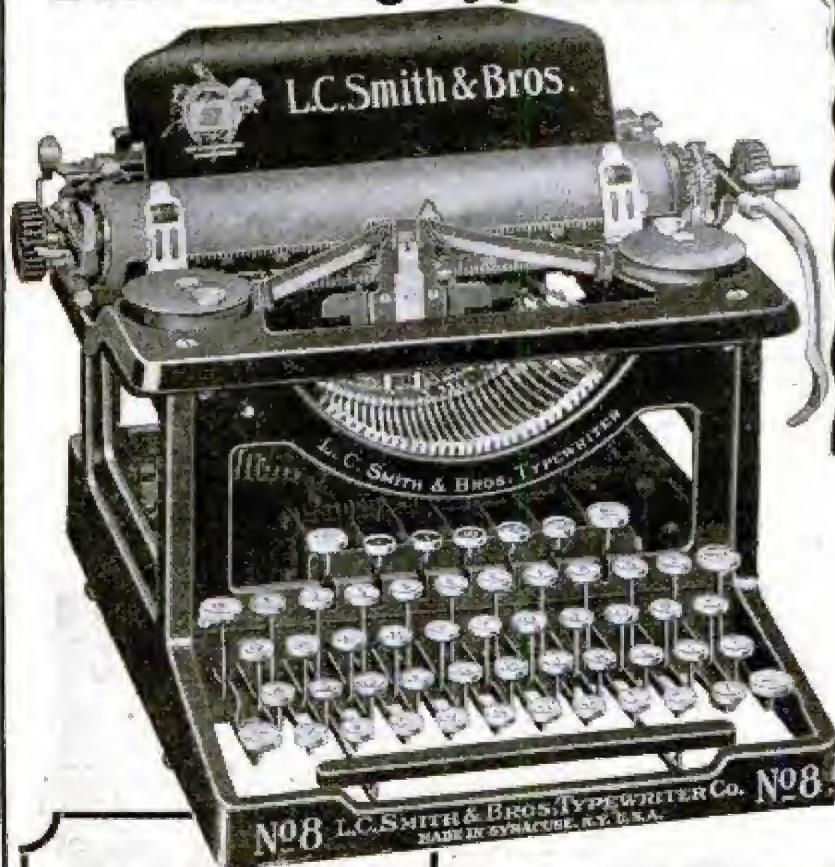
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References: Industrial State Bank, Chicago, Baker State Bank, Chicago.

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